COMMODORE USERS

Ahoy!

$2.50/ CAN. $3.00 DEC. 1985

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The Japanese have a word for it...

空手家

(EEEE-YAHHH!!!)

You are the star of a Martial Arts movie so real, you'll feel it like a kick in the ribs.

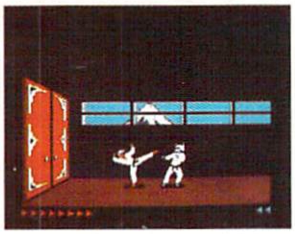
KARATEKA, you have learned well the disciplines of karate...but now it is time to put your skills to the test. Your village has been ransacked, your friends and family scattered to the winds, your bride-to-be, Princess Mariko, kidnapped and cruelly imprisoned by the evil warlord Akuma. If you ever hope to see her again, Karateka, you know what you must do.

Scale the mighty cliffs that lead to Akuma's fortress. There, you will encounter the first of many palace guards. Kick! Thrust! Parry! At every turn you will face yet another warrior, each stronger than the last.



Finally, Karateka, you will come face-to-face with Akuma himself. Here your fate will be decided. Either eternal happiness or instant death.

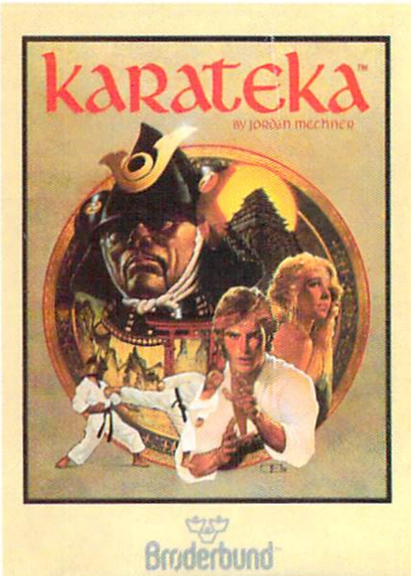
THE MAKING OF KARATEKA.



"Karateka" designer Jordan Mechner is a karate enthusiast and a stickler for realism. He used film clips of karate masters as a guide for the moves used in the game.

The carefully detailed, animated figures perform all the moves of real martial arts combat with stunning realism.

Beautiful scrolling hi-res backgrounds, an intricate story line and fast-paced karate action make "Karateka" a great way to get your kicks.



Brøderbund®

KARATEKA is available for Apple, Commodore 64 and Atari personal computers. Look for it at your favorite Brøderbund Software dealer. For more information about Brøderbund products, please write us at 17 Paul Drive, San Rafael, California 94903-2101. Apple, Commodore and Atari are registered trademarks of Apple Computer, Inc., Commodore Electronics, Ltd. and Atari Corporation respectively.

Reader Service No. 169

Ahoy!

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**Includes programs: COMMTX, COMMRX, COMMHS, and COMMHILO (for the VIC and 64)
***Includes programs: BLACKBOARD.S and SKETCHER for the C-64)

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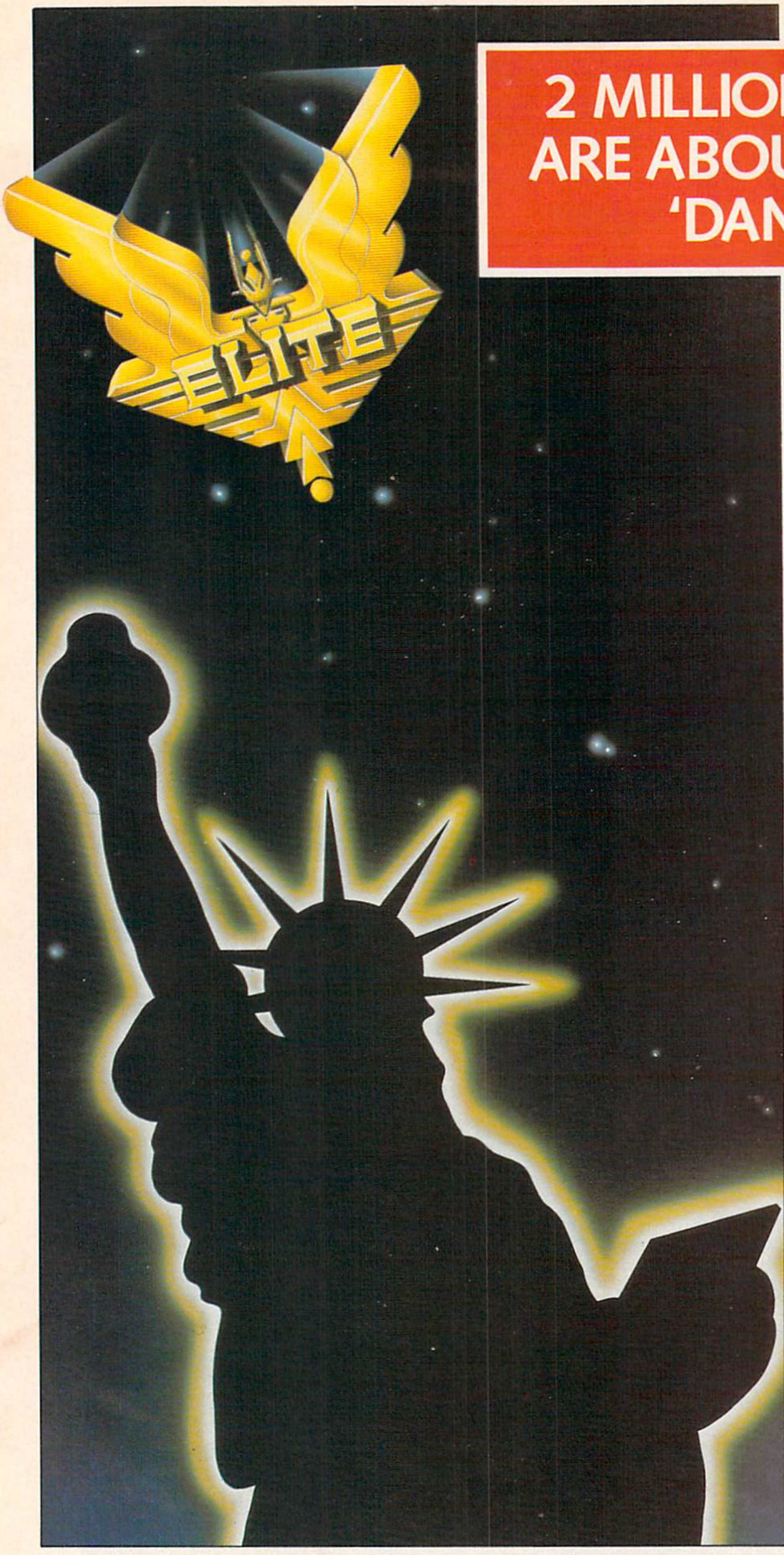
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2 MILLION AMERICANS ARE ABOUT TO BECOME 'DANGEROUS'

You could be one.

Play **Elite** – it's totally stunning.

Elite is Britain's 1985 Adventure Game of the Year, an interstellar mind-game with incredible 3D Vector-Graphic space flight simulation

Take command of your Cobra MK III combat craft, trade with alien cultures on over 2000 planets in eight galaxies. Pick your destination on the starmap, checking out the computer's 4-way viewscan – and you're ready for your first jump thru hyperspace.

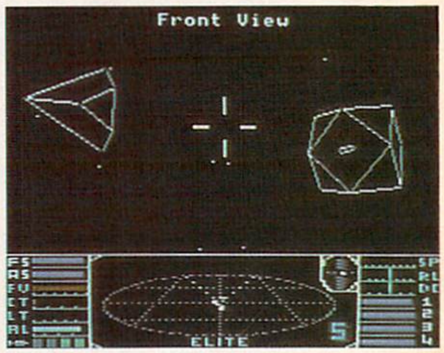
As a rookie you start with 'Harmless' status but with the right stuff and combat skills, you'll win ratings of 'Average' to 'Dangerous' – with your ultimate objective to become one of the **Elite**.

It's big, it's fast and it's here now for the **Commodore 64™** and **128**,™ complete with Manual, Novel, Control Guide, Ship Identification Chart, Keyboard Overlay **and** the opportunity as the US competition winner to get flown to London, England to try for the Elite World Championship.

It's so addictive it's been called "the Game of a Lifetime".

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Be dangerous.



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GOLD EDITION

VIEW FROM THE BRIDGE

It's hard to stay mad at us for long. Readers outraged by the absence of Morton Kevelson's popular hardware articles from our October and November issues will be more than appeased by the inclusion of two detailed hardware survey pieces in this issue—covering two of the most talked about categories in Commodore home computing!

In covering *Speech Synthesizers for the Commodore Computers,* Morton examines the theory behind generating voice-like sounds on a computer and looks in detail at five products useful in the process: Magic Voice, Voice Messenger-Speech 64, Voice Command Module, Voice Master, and Easy Speech 64. (Turn to page 33.) Next month he continues with Lis'Ner 1000, Hearsay, and ProVoice—plus detailed instructions on building your own speech synthesizer!

Morton has taken over our *Reviews* section for this month as well, with a look at three of the interfaces available for linking your C-64 to some of the high-powered IEEE-488 business peripherals now being sold at bargain basement prices. Also featured is the best-known of these peripherals, the $199, one megabyte SFD-1001 Disk Drive. (Turn to page 79.)

In 1941, the year Joe DiMaggio hit in 56 consecutive games, Ted Williams' .406 batting average went relatively unnoticed. We hope the same won't happen with *Gypsy Starship,* sharing this issue with Morton the K's masterworks. It is nothing more than the finest feat of programming ever generated for *Ahoy!*'s readers by Orson Scott Card—and those who've followed *Creating Your Own Games* from the beginning know that that's saying quite a bit. The best part is, along with providing the complete game, Orson Scott teaches you how to do just as well on your own! (Turn to page 18.)

Who is better qualified to pick *The Year's Best Commodore Entertainment Software* than Arnie Katz? For years he presided over the awarding of *Electronic Games* magazine's Arkies, the videogame industry's highest honors. And this summer, he and I were the two individuals elected by the Electronic Industries Association to judge Commodore software for the June '85 CES Software Showcase. Read the picks of Arnie and the *Ahoy!* staff beginning on page 47...followed by reviews of *The Alpine Encounter, Countdown to Shutdown, Slap-Shot, Crusade in Europe,* and *Super Huey.*

Dale Rupert continues to lead us where no Commodore magazine has gone before—to the IBM PC! If you don't have one, don't worry—*The IBM Connection* actually deals with linking any two computers via their RS-232 ports. (Turn to page 61.)

Cheryl Peterson has managed to do it again with this month's *Cadet's Column*—provide a feature geared to beginners that's just as relevant to the more advanced user. Join her on *A Tour of CompuServe's Commodore Information Network.* (Turn to page 95.)

Mark Andrews concludes his two-part *Commodore Roots* series on *High-Resolution Graphics,* providing the most detailed assembly language programs seen in his column to date. (Turn to page 91.)

We'll spare the hyperbole in our description of this issue's remaining programs. We don't have room for it—and besides, you know what to expect from *Ahoy!* in that department!

Cloak is a file encryption program for the C-64 or VIC 20. (Turn to page 108.)

Gameloader takes the work out of loading BASIC and ML games, and leaves only the fun. (Turn to page 107.)

Fun is just what you'll have playing *Jewel Quest* on your 64 ...unless Killough Bytes' robot sentries catch you in the process of making his priceless gem collection your own! (Turn to page 17.)

Santa's Busy Day is just what you need to keep the small children in your house quiet until Christmas morning. (Turn to page 118.)

Directory Manipulator generates eight helpful dictionary options controlled by the function keys. (Turn to page 113.)

Lineout provides an easy and disasterproof means of eliminating unwanted program lines. (Turn to page 90.)

This issue marks our completion of two years before the mast—24 straight months of bringing you the best package of Commodore goods we know how to put together. The fortunes of the home computer industry being what they are, we don't know if we—or Commodore—will be here in another 24. But we're going to plan on it, as we continue streamlining *Ahoy!* in the months ahead to most effectively serve our segment of the ever-changing Commodore market: the serious Commodore users on all levels.

—David Allikas



1541 FLASH!™

The new Skyles Electric Works **1541 Flash!** loads programs and files to your **Commodore 64** *three times faster* than an unenhanced Commodore disk drive can. **1541 Flash!** saves programs 20 to 50 percent faster. **1541 Flash!** formats a diskette in 25 seconds, a *real flash!!*

It gives your 1541 disk drive the speed of much more expensive drives. The Skyles Electric Works **1541 Flash!** is one of the most exciting time-saving devices we've ever seen.

It's Permanent
The **Flash!** is a permanent firmware installation in your **Commodore 64** and 1541 disk drive.

It's Transparent
Best of all, the **1541 Flash!** is transparent. Computer operations all remain unaffected as it speeds up every disk-related function. And there is nothing new to learn for the **Flash!** Once it's in, just watch it go.
We have tested it on well over five hundred programs and it loads spectacularly fast.

It's Easy
Installation of the **1541 Flash!** consists of plugging a small assembly inside the **Commodore 64** and two small assemblies plug into the Commodore 1541. Except for a small percentage of **Commodore 64s**, no soldering is required. Assembly instructions include detailed pictures and drawings. And installation is—well, a flash.

It's Available
Call Skyles Electric Works to place your order or to get more info on the **1541 Flash!** Hurry up, though. They may be gone before you know it.

128 COMPATIBLE

		FALL SALE
1541 Flash! C-64-128/1541	$109.95	79.95*
1541 Flash! C-64/1541	89.95	59.95*
1541 Flash! with diskswbd	99.00	69.95*
1541 Flash! for two drives	139.95	109.95*
SX-64 Flash!™	99.95	69.95*

Storage Power to the People

It's the largest
Yes, the Skyles Electric Works interfaced **Commodore SFD 1001** is the largest floppy disk drive available for the **Commodore 64**. How large? 1.058 million characters of storage. 6.22 times larger than the 1541 Disk Drive. Turn it on, format a diskette and the directory says 4133 blocks free!! No, this is not an expensive hard disk, it is a 5¼ inch, double sided, floppy disk drive. It is the same physical size, shape, color as the Commodore 1541 disk drive. It looks like a 1541, but it stores over 1 million characters of programs and data. Just think of it as 6.22 1541s in one. And at an amazingly low price!

It's the Fastest
Yes, the specially modified **QUICKSILVER**™ interface makes this fastest loading and saving floppy disk drive available for the **Commodore 64**. Over 6 times faster program and file loading than a 1541 disk drive. Twice as fast as a **1541 Flash!**. We made it this fast, because frankly, the advantages of a large disk memory almost disappear unless you have rapid access to the data. And at an amazingly low price!

It's the Least Expensive
Yes, on a price per character of storage basis, the **SEW/SFD 1001** is the least expensive floppy disk drive available for the **Commodore 64**.

128 COMPATIBLE

		FALL SALE
SEW/SFD 1001 Disk Drive System, C-64	$499.00	299.00*

QUICKSILVER™

Is the fastest IEEE-488 Interface available for the **Commodore 64**. How fast? As fast as the external IEEE-488 device will allow. For example, a program or file will load over six times faster from a Commodore 4040 or 8050 disk drive as compared to a 1541 disk drive. **QUICKSILVER** loads 7 times faster than a serial MSD drive. When used with printers speed is only limited by the printer.

QUICKSILVER is transparent. **QUICKSILVER** does not occupy any program memory. Almost all programs are completely compatible with **QUICKSILVER**. A word of caution, some IEEE disk drives have different formats, and 1541 formatted programs are not going to load. Some programs protect the disk by various operations in the 1541 disk memory. These programs will not load on non-1541 disk drives. However, for most uses **QUICKSILVER** is very quick and transparent.

QUICKSILVER is easy. Easy to plug into the cartridge port. Easy to plug additional cartridges into the built-in horizontal, cartridge port extender. Easy to locate your IEEE device within 2 meters (6½ feet) of **QUICKSILVER** using the built-in 2 meter IEEE cable. Easy to select which device numbers you want **QUICKSILVER** to interface to the IEEE bus. Easy to use with almost all programs. Easy to buy, at an amazingly low price, from Skyles Electrics Works or your local dealer.

128 COMPATIBLE

		FALL SALE
QUICKSILVER, C-64 Cartridge	$129.95	99.95*

*There is an additional $4.50 U.S. and Canada, $15.00 Europe and Asia, shipping charge per order. California residents add sales tax.

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This is just 1 of 15 pages of the newest and biggest Skyles catalog, hot off the press.

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EXPERT SYSTEMS • RAM CARTRIDGE • 80-COLUMN ADAPTER • WINDOWS PROGRAM • NEW COMPUSERVE, VIEWTRON BOARDS • DIGITIZER KIT • GAMES FROM INFOCOM, EPYX • SPEAKERS FOR AMIGA • 6 VOICES ON C-64 • CRT HOLDER • DISK DRIVE ALIGNMENT • COOKBOOKS • GREYHOUND PROGRAM • PRINTER STANDS

DISK DRIVE ALIGNMENT

The *1541 Disk Drive Alignment Program* from CSM Software consists of two disks: one containing the necessary utilities, and one precisely copied alignment disk which will allow you to perform an accurate alignment of your 1541 disk drive without use of any electronic measuring instruments. You can adjust drive speed, head alignment, and track one end stop. Price is $44.95 plus shipping.

CSM Software Inc., P.O. Box 563, Crown Point, IN 46307 (phone: 219-663-4335).

THE KEEPER

A cartridge that will retain 8192 bytes of memory even after you power down your C-64 or C-128, *The Keeper* will let you create autostart cartridges of your own programs as well as store programs for use upon power up. Unlike PROM programming systems, it utilizes virtual RAM that can be changed at will. Built-in software simplifies program storage. An in/out switch shuttles your program in and out of the computer's view. Price is $49.95 plus $3.00 shipping.

Marvco Electronics, 15702 S. Neibur Rd., Oregon City, OR 97045.

VIDEO DIGITIZER KIT

The package provides machine language software, plans, documentation, and a blank printed circuit board. You supply parts available at Radio Shack for about $20.00, and roughly an evening's time. The result: a black and white video digitizer for use with an NTSC video input source such as a VCR or video camera.

The completed unit, powered by the C-64's I/O port, will digitize an eight gray level, 160 X 200 pixel image in under three seconds. The included software allows keyboard control of gray scale selection (4, 6, or 8 levels). The digitizer permits control of brightness and contrast. An alternate dot pattern technique (dithering) is used to produce the 6 and 8 gray level display.

Price (for the software, plans, board) is $39.95 plus $2.00 shipping (specify disk or tape version).

Kinney Software, Dept. A, 121 N. Hampton Rd., Donnelsville, OH 45319 (phone: 513-882-6527).



Store an 8K program in virtual RAM.
READER SERVICE NO. 226

DISK DRIVE

The BCD/5.25 disk drive ($179.00), compatible with "thousands" of Commodore programs, offers faster speed (by 25%) and more compact size (2.75" X 6.4" X 13", 6 pounds) than the 1541. As with most 1541 replacements, the compactness is largely thanks to the external power supply–as is the reduced tendency to overheat.

Blue Chip Electronics, Inc., Two West Alameda Drive, Tempe, AZ 85282 (phone: 602-829-7217).

WINDOWS

We thought windowing for Commodore programs was a neat idea when we presented Thomas Bunker's *Windows on the VIC and 64* program in the August '85 *Ahoy!* St. Mars Systems apparently agrees, having just released the *Windows* Screen Processor Utility ($24.95). The program provides C-64 users with the capability of creating unlimited numbers of windows in their BASIC or assembly language programs. Supported are window color controls, move commands, independent scrolling, and cursor positioning routines. Included is a 12-page programming guide.

St. Mars Systems Inc., 1400 Clay Street, Winter Park, FL 32789 (phone: 305-657-2018).

NEW BANK OPENINGS

Broderbund has announced three additions to the Bank Street series for the C-64.

Compatible with the *Bank Street Writer,* the *Bank Street Speller* uses a 30,000+ word dictionary to find and highlight typing errors. Users can substitute "wildcard" characters for unknown or missing letters, and create personalized dictionaries by adding words of their own.

The *Bank Street Filer* will store, sort, retrieve, and print out customized reports. The database manager is supposedly easy enough for a child to use, but powerful enough to meet the requirements of adults, organizations, and small businesses.

The *Bank Street Mailer* comprises a letter-writing program (a special version of the *Bank Street Writer*) and a mailing list database with full mail/merge capabilities.

All three programs are scheduled for fall release, at $49.95 each. One backup disk is included with each.

Broderbund Software, 17 Paul Drive, San Rafael, CA 94903-2101

(phone: 415-479-1170).

CADPAK ENHANCEMENTS

Abacus has enhanced its Cadpak graphic package with the addition of a dimensioning feature that allows exact scaled output to most printers, the ability to input from the keyboard as well as an optional light pen, and a more flexible object editor (used to create detailed figures or text). Additionally, the list price has been reduced to $39.95.

Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510 (phone: 616-241-5510).



Only **A Mind Forever Voyaging** *can prevent a journey into global chaos.*
READER SERVICE NO. 230

NEW GAME RELEASES

In *A Mind Forever Voyaging* ($44.95), Infocom's latest release for advanced players, you are a computer that has been raised as a human being. Government and industry leaders have drafted a plan to address a global crisis: you must enact a simulation of that plan, exploring its effects on the future. This is the first in Infocom's series of Interactive Fiction Plus titles, employing a new development system with expanded memory (making possible a working vocabulary of over 1700 words). As such, the game is only for computers with 128K, including the Commodore 128 and the Amiga.

Concluding the trilogy begun by *Enchanter, Spellbreaker* (for expert-level Infocomers) places you in the pointed hat of the leader of the Circle of Enchanters. The magic of your world—a world founded on sorcery—is failing, and you must discern and destroy the cause. This you accomplish by undertaking a journey to the foundation of the magic itself. For the C-64 and the Amiga; $44.95.

Infocom, Inc., 125 CambridgePark Drive, Cambridge, MA 02140 (phone: 617-492-6000).

Based on Tolkien's classic, *The Hobbit* is an adventure that can be played with or without graphics (80 screen shots are included). Over 50 different action commands and over 900 words are understood by the program. Included are a copy of the novel, hint booklet, and a guide to Middle Earth. The Commodore 64 version ($29.95) includes an original soundtrack.

Addison-Wesley Publishing Company, Reading, MA 01867 (phone: 617-944-3700).

As the great knight *Corum*, you are summoned to the land of Peloria to save the fair princess Diana from the evil sorcerer Targoth, whose defenses include moorugs, groggs, skeletons, lava monsters, ghosts, bats, witches, slime monsters, and spiders. (Just how fair was that princess?) For the C-64; $14.95.

Tri Micro, 1010 N. Batavia, Suite G, Orange, CA 92667 (phone: 714-771-4038).

Idle Time II, the second C-64 disk culled from the IBM PC series, comprises eight one-player mental exercises (two with two-player versions as well), including numerical reverse, scrambled words, knowledge of US cities, colored square cube puzzle, and finding the correct mathematical equation to avoid a lunar crash. Price is $19.95 plus $2.00 shipping (PA residents add 6%).

ABLE Software, P.O. Box 422, Kulpsville, PA 19443 (phone: 215-368-2518).

Two for the C-64/128 from Artworx, priced at $19.95 each:

Falcon Patrol II pits the player's Falcon Fighter, equipped with air-to-ground and air-to-surface missiles, against enemy helicopter squadrons. Sixteen levels of play are included.

Sorcery, an adventure game in an arcadelike setting, challenges you (the last of the great sorcerers) to use a battery of powerful spells to reconquer your homelands and restore the rich life of a past era.

Artworx Software Company, Inc., 150 North Main Street, Fairport, NY 14450 (phone: 800-828-6573; in NY 716-425-2833).

Purchasers of 13 different Epyx game programs can participate in a sweepstakes program offering five trips to San Francisco and the Lucasfilm Games design headquarters, a ski week at Lake Tahoe, ski equipment, an Amiga computer, and free software. Details are available in those famous specially marked packages.

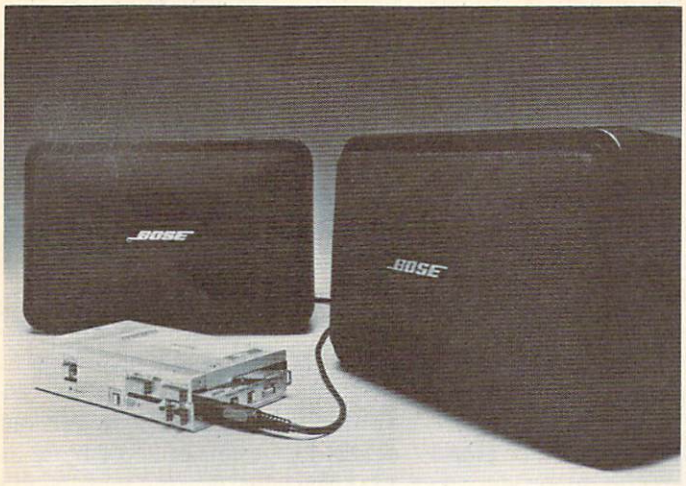
Epyx Computer Software, 1043 Kiel Court, Sunnyvale, CA 94089 (phone: 408-745-0700).

The game based on the Cubological Formulation mentioned in October's *Scuttlebutt* is available for $4.95. The collector's version, with a signed copy of the works that underlie the theory, sells for $99.95. And you thought Rubik's cube was a kid's game.

The Wizards (after Jan. 1, the Epsilon Research Group), P.O. Box 7118, The Woodlands, TX 77387.

THE LOUD COUPLE

Ideal for taking advantage of the Amiga's stereo output capability, the Bose RoomMate powered speaker system ($229.00) plugs directly into the computer, enabling users to generate room-filling sound comparable to complete component systems costing several times as much. Each speaker measures only 6 X 9 X 6".



Built-in electronics of the amplified RoomMates balance sound between the speakers, providing true stereo or enhanced hi-fidelity. ***READER SERVICE NO. 231***

The onboard electronic amplifier and equalizer were engineered for low distortion and reduced hiss. Also available are the Video RoomMates, offering volume control and shielded drivers to prevent TV interference. Either model can also be used with Walkman-type portable tape players and portable CD players such as those available from Sony and Technics.

Bose Corporation, The Mountain, Framingham, MA 01701.

MICRO CLEANING KIT

The Read/Right Microcomputer Cleaning Kit ($34.95) is designed to remove damage-causing contaminants from the head, screen, and housing of your computer. Included are a floppy disk head cleaner good for up to 15 cleanings of the read/write heads, *Static Stopper* spray, 24 terminal cleaning pads and 10 office equipment cleaning pads.

The Texwipe Company, 650 E. Crescent Ave., P.O. Box 575, Upper Saddle River, NJ 07458 (phone: 201-327-9100).

EDUCATIONAL RELEASES

Welcome Aboard ($24.95) utilizes Muppet characters and a nautical setting to teach new C-64 users about five computer concepts: computer-aided design (by helping Gonzo beautify Miss Piggy in the Salon de Beauté), word processing and electronic mail (by transmitting information from the message center to help Captain Kermit stay on course), database management (by helping Fozzie sort through his joke library), programming, and games. Included is *The Muppet Guide to Computerese,* an illustrated glossary of terms.

Broderbund Software, 17 Paul Drive, San Rafael, CA 94903-2101 (phone: 415-479-1170).



New releases from Learning Activities. READER SERVICE NO. 232

Joining the 40+ programs in Resource Software's line of CP/M-based programs for the C-128 with 1571 disk drive, the Honors Series drills students in advanced mathematical disciplines.

Honors Calculus covers applications of the derivative including curve sketching, related rates and maximum/minimum problems, and applications of definite integral topics.

Honors Trigonometry deals with circular functions, polar coordinates, identities, sine and cosine, and solution of triangles.

Honors Geometry addresses similar polygons with attention to radio and proportion, applications of similar triangles, coordinate geometry, and the circle.

Honors Algebra focuses on polynomials, factoring common monomials, trinomials, and the difference between squares.

Each is available for $34.95, with more titles on the way.

Resource Software International, Inc., 330 New Brunswick Ave., Fords, NJ (phone: 201-738-8500).

A French language version of Scarborough's *MasterType* typing tutorial, one of the best-selling C-64 educational programs of all time, has been released.

Scarborough Systems, Inc., 55 S. Broadway, Tarrytown, NY 10591 (phone: 914-332-4545).

Snowdrifts and Sunny Skies teaches fledgling forecasters eight years old and up to predict the weather utilizing a map showing fronts and pressure areas (following lessons on weather folklore, terminology, and the historical weather pattern for the city and month you've chosen). After investigation, you predict tomorrow's weather and obtain a score based on the accuracy of your prediction versus the actual weather. For the C-64; $14.95.

Tri Micro, 1010 N. Batavia, Suite G, Orange, CA 92667 (phone: 714-771-4038).

Learning Technologies Inc. has announced 20 new C-64 programs for preschoolers through eighth graders, available for $19.95 each.

In the Early Learning Series: *The Flying Carpet* (shapes), *Let's Go Fishing* (numbers), *How to Weigh an Elephant* (ordering and sequencing), *Learning to Add and Subtract, Math in a Nutshell* (counting), *Clowning Around, Shutterbug's Patterns, Bike*

Hike, Animal Hotel, Same or Different, and *Lion's Workshop* (assorted visual skills).

In the Thinking Strategies Series, designed to develop problem-solving skills: *Scrambled Eggs, Sliding Block, Monkey Business, Speedy Delivery, Alpine Tram Ride, Gremlin Hunt, Pipeline,* and *Number Please.*

If you return the response card included in any Learning Technologies program, you will receive a teacher's Learning Kit that includes a color poster, lesson plan, worksheets, student management chart, and award certificates, plus the opportunity to win a Commodore 128 or Apple IIc computer in the company's Screen Stars Sweepstakes.

Learning Technologies, Inc., 4255 LBJ, Suite 131, Dallas, TX 75244 (phone: 214-991-4958).

SLIPPED DISK

Users within a drive, bus trip, or mooseback ride of Madison Heights, MI can take advantage of Slipped Disk, Inc.'s software and hardware preview center, C-64 social club, educational center, rental computers, and library of computer periodicals for $50.00 a year. The center is open 12 hours a day, 7 days a week.

Slipped Disk Inc., 31044 John R, Madison Heights, MI 48071 (phone: 313-583-9803).

OKIMATE 10 REBATE

If you purchase an Okimate 10 Personal Color Printer before January 31 and return the form available at your dealer with sales receipt and UPC label or stock number, you will receive a $15.00 rebate from the manufacturer. Offer is good only in the U.S.A. The price of ribbons for the Okimate 10, by the way, has been reduced to $4.95 each for black and $5.49 each for color.

Okidata, 532 Fellowship Road, Mount Laurel, NJ 08054 (phone: 609-235-2600).

WORLD OF COMMODORE

The World of Commodore III, the third annual exposition for Commodore users, will be held this year from December 5 to 8 at the Toronto International Centre. Commodore will exhibit the C-128, Amiga, and PC 10/PC 20 computers, and software, peripherals, and other items will be displayed and sold by a host of exhibitors (including your favorite Commodore magazine). Last year's show drew more than 40,000 visitors, so it's recommended that you make travel and hotel arrangements as early as possible.

Admission price will be (in Canadian dollars) 4.00 for adults, $3.00 for students and senior citizens, and $10.00 for a four-day pass. Advance tickets for groups of 25 or more are $2.00 each per day, but must be purchased before November 15.

Contact Hunter Nichols Inc., 721 Progress Ave., Scarborough, Ontario M1H 2W7 (phone: 416-439-4140).

PRINTER STANDS

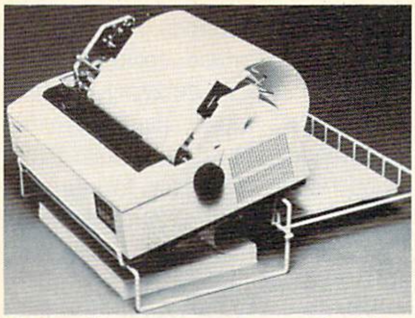
The Pedestal printer stand stores paper underneath the printer and catches and refolds the printout in a receiving tray. Built of vinyl-covered heavy duty steel wire, the putty-colored stand is available in widths to accommodate 80- or 132-column printers ($28 and $34 respectively).

Computer Coverup, Inc., 1740 N. Marshfield, Chicago, IL 60622 (phone: 312-276-9007 or 1-800-282-2541).



Universal Printer Stand: 7° slant.
READER SERVICE NO. 227

The Universal Printer Stand ($19.95), constructed of molded plastic, features a seven degree forward slant to allow easy printout viewing. Paper guides prevent cables from interfering with paper feed; rubber feet reduce noise and protect desk tops. The stand is wide enough to accommodate most bottom- and rear-feed



Pedestal stores, catches, and refolds.
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printers of up to 132 columns.

PerfectData Corporation, c/o Rogers & Associates, 2049 Century Park East, Suite 4060, Los Angeles, CA 90067 (phone: 213-552-6922).

TELECOM NEWS

Not content with cutting into the U.S. Post Office's business via electronic mail, CompuServe has now made available the FBI's 10 Most Wanted List. Biographies and descriptions of the fugitives can be read and high resolution graphic pictures of the individuals downloaded and viewed. Watch out, software pirates.

CompuServe, 5000 Arlington Centre Blvd., P.O. Box 20212, Columbus, OH 43220 (phone: 614-457-8600).

Viewtron now offers trading prices for nearly 100 commodities, updated every 10 minutes with prices gathered from 14 exchanges. When a subscriber requests a price quote, all the contracts in a given commodity are listed with their opening, high, low, and last available prices, along with the change from the previous settlement price.

Viewdata Corporation of America, Inc., 1111 Lincoln Road, 7th Floor, Miami Beach, FL 33139 (phone: 305-674-1444).

For $9.95 per month and 6¢ per minute (with the first hour free), Quantum Link offers Commodore users programs to download, software previews, online games and contests, electronic mail, shopping and swapping, world news, discussion forums, an encyclopedia, and more. (To be added soon are banking, investment, and financial services.) The system operates 24 hours a day weekends and 6 p.m. to 8 a.m. weekdays. A free preview is offered to all C-64 and C-128 owners; call 800-833-9400 (using your modem) to register. Communications software and one month of service is given away with purchase of the Commodore 1660 or 1670 modem.

Quantum Computer Services Inc., 8620 Westwood Center Drive, Vienna, VA 22180 (phone: 703-448-8700).

Intended to suppress damaging phone line spikes, the Kleen Line security system ($69.95) employs two-stage semiconductor and gas discharge tube suppression techniques. Available for standard 4-pin telephone modular connectors (RJ-11) and the wider 8-pin connectors (RJ-45).

Electronic Specialists, Inc., 171 South Main St., P.O. Box 389, Natick, MA 01760 (phone: 1-800-225-4876; in MA 617-655-1532).



Kleen Line guards against spikes.
READER SERVICE NO. 229

BOOKS

The Commodore Ham's Companion details the basics of upgrading your system for amateur radio use, programming for data including RTTY, Morse, AMTOR, and Packet and the ins and outs of information management. Also included is information on "telehamming" (connecting to amateur radio information by telephone line), message storage operations, and finding specialized software for slow can TV, satellite tracking, and other applications. Price is $15.95 plus $2.50 shipping.

QSKY Publishing, P.O. Box 3042, Springfield, IL 62708.

Computer Entrepreneur ($29.95) describes over 100 businesses that the computer owner can run from his home, ranging from keeping statistics for little league teams to legal research. Included is a self-test to find the business that the reader is best suited for.

Computer Information Limited, 11 The Point, P.O. Box 181948, Corona-

do, CA 92118 (phone: 619-266-9141).

Starting Your Computer Services Business ($9.95) also discusses various aspects of using a home computer to earn extra money. Various business formats, such as sole proprietorships, partnerships, and corporations, are examined in detail.

J.V. Technologies, Inc., P.O. Box 563, Ludington, MI 49431 (phone: 616-843-9512).

Investment Management with Your Personal Computer ($14.95) discusses investment software, electronic databases, and online trading, listing and reviewing over 120 products and services including spreadsheets, portfolio managers, investment simulations, and bond and mutual fund aids.

COMPUTE! Publications, Inc., 324 W. Wendover Ave., Suite 200, Greensboro, NC 27408 (phone: 919-275-9809).

The World Almanac Book of Inventions (10.95) traces the history of inventions from ancient times up to the present, including a detailed section on the evolution of the computer.

World Almanac Publications, 200 Park Avenue, New York, NY 10166.

SPEECH SYNTHESIZER

Announced too late for inclusion in this month and next's feature on *Speech Synthesizers for the Commodore Computers,* the Votalker C-64 ($99.95) includes a screen echo that allows any words, numbers, punctuation marks, and other symbols printed to the screen to be spoken.

Three types of vocalization are supported: conversation mode (reads text in a natural way, pausing at punctuation marks), verbatim mode (reads text and pronounces symbols), and character mode (spells each word and pronounces numbers and symbols).

The 4 x 5" unit plugs into the 64's expansion port and contains its own amplifier, speaker, and external speaker jack, with no need to buy any additional cables, hookups, or hardware. All necessary programs and enhancements are stored in onboard ROM and accessed by a single key.

If you purchase Votalker C-64 before the end of 1985, you'll receive Trivia Talker II for free. The $39.95 program contains 200 questions in each of five categories.

Votrax, Inc., 1394 Rankin, Troy, MI 48083-4074 (phone: 313-588-2050).

80-COLUMN ADAPTER

In the August '85 *Ahoy!*, Morton Kevelson showed you how to do it. Now Microvations has done it for you by manufacturing an interface cable that permits the C-128 owner to utilize the Commodore 1701 or 1702 (or any color or monochrome) monitor in 80-column mode, eliminating the need to buy the 1901 RGB monitor for this purpose. The user can shuttle between 40 and 80 column modes with a simple ESCAPE-X command. List price is $14.95.

Microvations, 5333 Mission Center Road – Suite 345, San Diego, CA 92108 (phone: 619-291-2722).

TELECOM PRINTER

The Microline 182 TTY differs from Okidata's standard 182 by offering selectable intelligence levels and an optional communications roll paper stand to meet the needs of telecommunications applications.

In TTY mode, the printer responds only to carriage return, line feed, and form feed commands, preventing extraneous commands from corrupting received data or delaying the printer. In CRT mode, page formatting commands are added. Basic Printer mode adds character format commands, while in Intelligent Printer mode the 182 TTY functions exactly like a standard 182.

Okidata, 532 Fellowship Road, Mt. Laurel, NJ 08054 (phone: 609-235-2600).

6-PART 64 HARMONY

The *Visible Music Monitor* and the *VT-6* cartridge made six-part harmony possible on your C-64 or C-128, with the former adding an extra sound chip (three more voices) and the latter supporting both sound chips, allowing creation, editing, playing, displaying, and disk or tape storage and retrieval of music.

Editing features include moving or changing notes, measures, and segments, cut, paste, and copy, and control over all chip sounds. The user also has control over the sequence in which music segments are played or repeated. A playlist may be specified to play a group of songs automatically.

Price of the system is $89.00.

V-Tech, Inc., 2223 Rebecca, Hatfield, PA 19440.

EXPERT SYSTEMS

Info Designs has released a line of expert systems designed to aid the businessman. Each C-64 program, priced at $79.95, works by questioning the user extensively about himself and about a specific counterpart, and then generating a strategy.

The Sales Edge advises the salesman on the business style and personality most likely to make a hit with a given client.

The Management Edge explains how to get desired results from a specific individual.

The Communication Edge enables the user to operate more effectively in meetings and conversations.

The Negotiation Edge develops a detailed plan for any type of negotiation or bargain.

Info Designs, Inc., 445 Enterprise

Continued on page 94

JEWEL QUEST

For the C-64

By Bob Blackmer

Famed adventurer Lars Layton, always ready for a challenge, stars in this arcade game. In it, you must maneuver Lars in his gyrocopter as he attempts to lay claim to the priceless gem collection of eccentric billionaire Killough Bhytes.

This adventure began when Lars attended a cocktail party, hoping to find a financial backer for his next endeavor. He was introduced to Mr. Bhytes, upon which he listened to a tale unlike any he had ever heard.

The aging industrialist told Lars of the unique system by which he protected his jewel collection. He first described the large room with shelves covered with a secret material. It saps energy from any who come in contact with it, man and machine alike. He went on to explain about the four robot sentries, covered with the same deadly substance, who patrol silently and thoroughly.

The ninety stone collection is further protected by a cloak of invisibility that allows only one gem to be seen at a time. When Killough Bhytes wants to view or move his collection, it is annoyingly simple. The secret substance is harmless to him exclusively, and when he takes one jewel, another appears elsewhere on the shelves, and so on, until he has his whole collection.

Lars also learned of the many people who had tried in vain to get the treasure, since no one escapes unless he has all ninety stones.

Mr. Bhytes offers to finance all of Lars Layton's further exploits if he can succeed where others have failed. Layton's reply is simply this: "Ladies and gentlemen, start your gyrocopters!"

Instructions on flying are provided at the start of your first game. The key is learning to maneuver your gyrocopter, keeping contact with the shelves and the robots to a minimum. Once this is mastered, you'll still need energy for the later levels. After you complete level 7, the robots will double their speed, making it impossible to collect all the gems without some energy loss. You'll begin with 99 energy units; make them last because you'll get no more.

After thorough testing, the best I did was to finish with 61 energy units remaining. □

SEE PROGRAM LISTING ON PAGE 124



CREATING YOUR OWN GAMES ON THE COMMODORE 64

The Gypsies reached Crete by 1252 and Paris by 1427. How long they had been wandering before that, no one can say. If *they* knew, they weren't telling. They camouflaged themselves in order to survive. In Christian Europe, they claimed to be pilgrims returning from shrines in Egypt—thus the name *Gypsies.* Standing aloof from every nation, they wandered from place to place to buy and sell and trade. They were accused of every imaginable crime. They were banished from Venice and Milan. Frederick William I of Prussia ordered all Gypsies over the age of 18 to be hanged. Catherine the Great of Russia tried to make them serfs and tie them to the land. Hitler killed half a million Gypsies in his death camps.

Still they survived, wandering. Linguists discovered that their original language, called Romani, was actually an archaic dialect of Sanskrit—had they come from northern India, then, two thousand years ago? It didn't matter. They weren't looking to the past—they were looking to the future. To the stars.

Now, in second-hand starships, with gear cobbled together from a hundred different sources, they are still wandering from planet to planet, buying here, selling there, trying to turn a profit. In the process, they discover worlds no other human being knows. But they don't make maps and charts. They make deals.



Gypsy Starship

Machine-language interrupts combine with a "slow" BASIC program to let you discover a hundred different worlds in this complete game for the Commodore 64.

By Orson Scott Card

You are the head of a Gypsy Family, which makes you captain of a Gypsy starship. Your two most important concerns are getting enough fuel to keep flying, and enough supplies that the Family won't starve. Fuel is easy enough to get—you simply dip down near the surface of a "gas giant," a large planet like Saturn or Jupiter. Those are a dime a dozen in this galaxy.

Supplies are a different matter. For that you have to visit worlds with life on them: small, rocky earthlike planets, or, more rarely, moons and artificial satellites orbiting the gas giants. Some planets are lifeless; some have no intelligent life; some are inhabited by aliens who have never seen humans before. When you do find humans, they might be hostile to Gypsies, or suspicious of you. They might be pirates. They might, sometimes, be friendly.

Friendly or unfriendly, known or unknown, you have to feed the Family. On some worlds you barter. On others you offer services, like repairing starships and other sophisticated machines. Sometimes you put on entertainments. Sometimes you ask for favors (you never actually *beg*). Sometimes, when you have to, you steal. And when things get hot, you dump your cargo and get moving. Because all that matters to you is for the Family to survive and move on.

PLAYING *GYPSY STARSHIP*

You'll need a joystick plugged into port 2. When the game begins, your starship is in the middle of the screen. Gas giant and earthlike planets will drift by on the screen. There are also stars in the background. The bottom of

TOM CUSHWA



Some Historic Breakthroughs Don't Take As Much Explaining As CompuServe.

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Our full range of games includes "You Guessed It!", the first online TV-style game show you play for real prizes; and MegaWars III, offering the ultimate in interactive excitement. And there are board, parlor, sports and educational games to play alone or against other subscribers throughout the country.

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MAKE PHI BETA KAPPA

Grolier's Academic American Encyclopedia's Electronic Edition delivers a complete set of encyclopedias right to your living room just in time for today's homework. It's continuously updated ... and doesn't take an inch of extra shelf space.



The College Board, operated by the College Entrance Examination Board, gives tips on preparing for the SAT, choosing a college and getting financial aid.

KEEP HEALTHY

Healthnet will never replace a real, live doctor—but it is an excellent and readily available source of health and medical information for the public.

Human Sexuality gives the civilization that put a man on the moon an intelligent alternative to the daily "Advice to the Lovelorn" columns. Hundreds turn to it for real answers.

BE INFORMED

All the latest news is at your fingertips. Sources include the AP news wire (covering all 50 states plus national news), the Washington Post, USA TODAY Update, specialized business and trade publications and more. You can find out instantly what Congress did yesterday; who finally won the game; and what's happening back in Oskaloosa with the touch of a button. And our electronic clipping service lets you tell us what to watch for. We'll electronically find, clip and file news for you...to read whenever you'd like.



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First, relax.

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In fact, if you know how to buy breakfast, you already have the know-how you'll need to access any subject in our system. That's because it's "menu-driven," so beginners can simply read the menus (lists of options) that appear on their screens and then type in their selections.



Experts can skip the menus and just type in "GO" followed by the abbreviation for whatever topic they're after.

In case you ever get lost or confused, just type in "H" for help, and we'll immediately cut in with instructions that should save the day.

Besides, you can either ask questions online through our Feedback service or phone our Customer Service Department.

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the screen shows your current fuel level (yellow line) and amount of supplies (red line). Your fuel is used up by *moving;* the supplies are used up by the passage of *time.* So if you sit still and do nothing, you'll have plenty of fuel–but the Family will risk dying of starvation, or running out of oxygen and water!

To visit a planet, you must get into "stationary orbit." That is, you must move *with* the planet as it travels across the screen. This is easier than it sounds, though it takes a little practice. Since the planets move diagonally, the easiest technique is to get in front of the planet, let it pass over you, and *while it is passing* begin to move in the same diagonal direction. Since the program won't let you move over a planet, you will seem to be following along behind the planet, as if you were pushing it along its path. That is "stationary orbit," and if you keep doing it long enough, you will automatically replenish your fuel (if it's a gas giant) and *half* your supplies (if it's an earthlike planet).

Why only half your supplies? Because all you can get from an earthlike planet, without *landing,* is oxygen, water, and carbon dioxide–stuff you can scoop up from the atmosphere. To trade, explore, and get a complete resupply, you have to land.

To send down a landing party, just get in stationary orbit and press the joystick button. Depending on your difficulty level, it may take a while to successfully land. When you land, the entire outerspace display disappears. Instead, you see a screen consisting of information about the planet and your options:

LOOK AROUND
ASK QUESTIONS
PUT ON A SHOW
OFFER TO TINKER
DICKER WITH THE LOCALS
ASK FOR HELP
TAKE WHAT WE NEED
GET OUT OF HERE
RETIRE

By moving the joystick, you move a cursor to point to a choice; when you press the button, the program carries out whatever choice you made.

The game lasts for ten "years," at which time the value of your cargo is evaluated and you retire as head of the Family and captain of the starship. You either end up living in luxury, getting by on a pension, or begging in the streets. If you did a particularly good job as captain, the ship will be named after you and the Family will honor you forever.

Then, if you want, you can start over and play again.

HOW THE PROGRAM IS SET UP

If you typed in and ran the program *Starship* from last month's *Ahoy!*, you'll recognize the outer space screen display at once. It's the same starship, the same planets that you saw before. The purpose of last month's program was to demonstrate full use of sprites in machine language interrupts. This month's program shows how to turn that mechanical shell into a real game.

The game plays in two parts. The first part, in outer space, is a pretty standard arcade-type movement game. You have to be dextrous enough to get the starship into position. You have to monitor the fuel and supplies and keep both replenished. You also have to decide when and where to land. Almost everything else is done in machine language.

Once you land, you move into the second phase of the game. Since this involves reading information about the planet or moon that you've landed on, it doesn't have to move quickly. Almost everything is done in BASIC. Once you've made your choices and decide to GET OUT OF HERE, this section of the program sets up that particular planet-sprite to be another world, randomly selected from the available planet data.

If you choose to quit (RETIRE), you are shown the current outcome and given a chance to resume where you left off, start a new game, or continue playing.

WHAT'S ON DISK?

The game is listed here as four separate programs. The first program is *Video Setup.* It is essentially the same program as last month. It sets up all the machine language and sprite shapes in memory from 32K to 40K, and then saves that region of memory in a disk file called GYPSY VIDEO.

The second program is *Planet Setup.* It READs the information about possible planets from DATA statements and stores them in memory from 16K to 32K. Then it saves this region of memory in a disk file called GYPSY PLANETS.

The third program is *Gypsy.* This does nothing more than load GYPSY VIDEO into memory from 32K to 40K, load GYPSY PLANETS into memory from 16K to 32K, and then load and run *Gypsy Game.*

Gypsy Game is the actual game program itself. Provided the video and planet data are all correctly in memory, *Gypsy Game* should move you easily into play.

Notice that you only need to run *Video Setup* and *Planet Setup* once. After GYPSY VIDEO and GYPSY PLANETS are on disk, the setup programs are never used again. (If you buy *Ahoy!*'s disk, GYPSY VIDEO and GYPSY PLANETS are already there—you just LOAD "GYPSY",8,1 and RUN.)

FROM SHELL TO GAME

How did we get from last month's sprite-mover program to this month's game? It was a matter of story. There are lots of things you can do with a starship and a bunch of planets.

In fact, I didn't have to use a starship or planets at all. I could have changed the sprite shapes and made it Dorothy against the Nerds of Oz. (My son Geoffrey has been after me for a year to program a game called "Toto," which he designed, in which Dorothy's dog is trying to get back to her without getting nabbed by any of the evil beings of Oz. Maybe I'll do that early in '86, just to show how versatile this animation and movement shell can be.)

Even with the starship and planets, though, there were many options. It could have been a shoot'em-up game with an enemy starship, but that's old hat. Or a blast-the-planets game, but I've blown up too many planets already as a science fiction writer. It could have been a military-invasion game, or colonization of the stars, or a rescue mission—but in all those scenarios, most of the action would have been on the planet's surface, so that the present animation shell would have been better used for the on-planet action rather than outer space.

Since the computer game I like the best these days is *Seven Cities of Gold* (Electronic Arts), I was naturally drawn to the idea of exploration. Now, if I were to do this in first-rate fashion, I would also animate the on-planet sequences, as *Seven Cities* does. But that would require setting up another section of video memory with sprites and a whole new set of interrupt programs in machine language. Instead, I decided to leave this section as a text game, though it is still handled entirely with the joystick. I'm a writer, after all—I think that sometimes a few words can do better than a thousand pictures. And since the text section can be in BASIC, it'll be easier for my fellow "intermediate programmers" to follow what I'm doing.

Given the limitations that the computer and the pre-selected forms placed on me, I still had to come up with a story that intrigued me, that made the events of the game interesting to me—and therefore, with luck, to you also.

For a short story I'm working on right now, I bought a book called *Atlas of Man* (St. Martin's Press), a marvelous collection of information about many of the different peoples of the Earth, sorted by ethnic rather than national boundaries. I happened to see the section on Gypsies, and realized that the Gypsies fit exactly what I needed my starship to do—wander from place to place, not caring whether it ever returned to the same spot again. And all that wonderful Gypsy lore from a thousand years of European contact with Gypsies made them at once familiar and mysterious. From there it was easy to imagine the kinds of things that Gypsies might do on a planet's surface. Once I knew who the people in the starship were, the rest of the game fell into place.

I've said in earlier columns that it's better to start designing a game with a *story* rather than a *programming concept,* and that's still true. But let's face it. A lot of times, especially for self-taught novices like you and me, we feel pretty lucky to know anything at all! So instead of imagining the perfect game, we try to think of the best game that we can program at our present level of expertise—or, maybe, just a few steps ahead of where we are now.

But the game still won't come to life until you have a story that you care about and believe in, an idea that delights you. The technique alone isn't enough. Just be-

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cause you can move sprites around and read the joystick doesn't mean that you've got a game. Last month we moved the sprites around, read the joystick, checked collisions, and animated the sprites, all at machine language speed—but it wasn't a game.

It isn't a game until it has a story or a puzzle or a problem. Then you can design the rules to make it challenging and yet playable. I hope you like this one. I think it's kind of fun.

It's also *long.* But I think you've caught on by now to the fact that the best games *do* eat up memory—because good video and good text take space.

In fact, it takes up so much space that for this game to be *really* good, it would need to have mid-game disk accesses. Then we could set up solar systems, with the planets orbiting stars, and let the stars drift, planets and all, the way stars really do. The starships could go into hyperspace and "jump" from system to system. And when we got to the planets, we could actually *see* the alien or human creatures we were meeting. There are a lot of fantastic things that *could* be done.

If I had six months to work on it. If I didn't know that the people who would use the game would have to type it in, letter by letter. If the good folks at *Ahoy!* didn't have this crazy idea that 300-sector programs take up too much space in the magazine. There are *limits* to what can be done in a monthly column.

But if *you've* got the time, you can do it yourself. That's what a magazine like *Ahoy!* is all about, isn't it? For you to do it yourself. Even when a game is as "complete" as this one!

A WRINKLE IN THE INTERRUPTS

Last month, when we first worked with machine language interrupts, we used the regular timer interrupt. But this time I needed to use a different interrupt source. So I disabled the timer interrupt by POKEing (actually, STAing) a 1 into location 56333. I replaced this interrupt with a raster interrupt.

The raster scan is the path followed by the cathode ray inside your TV or monitor picture tube, as it moves from left to right across each line, line by line down the screen. It takes less than a sixtieth of a second to scan the whole screen; then the ray returns to the upper left hand corner and starts over.

The VIC-II video chip in your 64 sends the TV or monitor all the information about what color to display in each dot on each line of the television screen. The VIC-II reads this data from screen, character, color, and sprite memory; interprets it according to the selected color and location codes; and then sends the fully interpreted and translated data to the TV in a form the television can understand.

Inside the computer, each time the VIC-II prepares to send a scan line's worth of data to the TV, it stores the number of the current screen line that it is scanning at location 53266. This is a number from 0 to 261. (The scan lines that are actually shown on the screen are from 50 to 249.) That's what you'll see if you PEEK(53266). But if you POKE a number into 53266, something completely different happens. The number you POKE will be remembered, even though you can't PEEK and see it, and every time the VIC-II scans the line with the same number as the one you POKEd there, the VIC-II will generate an interrupt request—an IRQ.

And when that happens, the current program (including BASIC), is stopped, the computer jumps to the address stored at locations 788 and 789, and it begins executing the machine language program stored there. It continues executing that code until it meets an RTI instruction (or jumps back into the regular interrupt routine). *Just like the regular timer interrupt.*

Of course, you have to enable the Raster interrupt by POKEing 53274 with 1, and each time the interrupt is executed, you have to clear the raster interrupt flag by POKEing 53273 with 15.

Also, since there are 262 scan lines and location 53266 can hold no value higher than 255, the last 6 scan lines are signaled by the high bit at location 53265 (the way that sprite locations to the right of the "International Date Line" are flagged at location 53264). However, I've found that the simplest solution is to make sure that the high bit is set to 0 with POKE 53265,PEEK(53265)AND127 and then never try to generate an interrupt at a scanline higher than 255.

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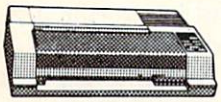
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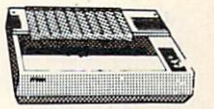
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What's the advantage to this?

Because the interrupt is tied to an actual position on the screen, the interrupt can *change the screen* in the middle of the display!

That's what this program does – it's the most important alteration from last month's animation routines. An interrupt is generated at scanline 234 – the beginning of the penultimate text line. That interrupt executes a routine that clears the interrupt flag, resets the vector to point to a different interrupt routine, and then fiddles with video memory:

It sets the screen memory pointer at 53272 to point to a different location.

Since the sprite location table is the last eight bytes of the 1K block that contains screen memory, the VIC-II will look for sprite shapes at a completely different place – and in this case, all the sprite shapes will be completely blank.

The effect is simple. Now the BASIC program can completely ignore the stars in the background on the upper part of the screen. Instead, it will PRINT the fuel and supply gauges on the last two liness of a *different screen memory.*

While it's doing that, though, the sprites are still moving around on the screen. When a sprite reaches scanline 234, the VIC-II suddenly starts loking for its shape in a different place; when it finds it, the shape is blank. Any part of the sprite that falls below scanline 234 is completely invisible.

What have we done? Why, moved the bottom of the screen up two text lines, as far as the sprites are concerned. If we cause the starfield screen to scroll upward, the screen memory that contains the fuel and supply gauges is not affected; if we clear the gauge screen, the starfield is not affected.

Don't look now, but that's called "windowing." The top 23 text lines are a window into one screen memory; the last 2 lines are a window into another.

That interrupt routine generated at scanline 234 also set location 53266 to generate another interrupt at a later scanline. So only a few scanlines later, the VIC-II causes another interrupt. This one sets everything back to normal – and then goes ahead and executes the animation and movement routines from last month's program.

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SEE PROGRAM LISTINGS ON PAGE 131

Next month in Creating Your Own Games on the Commodore 64...

Orson Scott Card will explain the extended background color mode used in this month's *Gypsy Starship,* and how you can use it to create windows in C-64 programs (along with providing a demonstration program).



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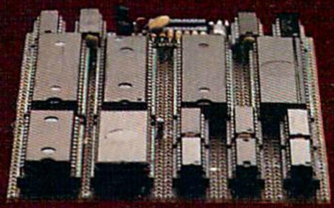


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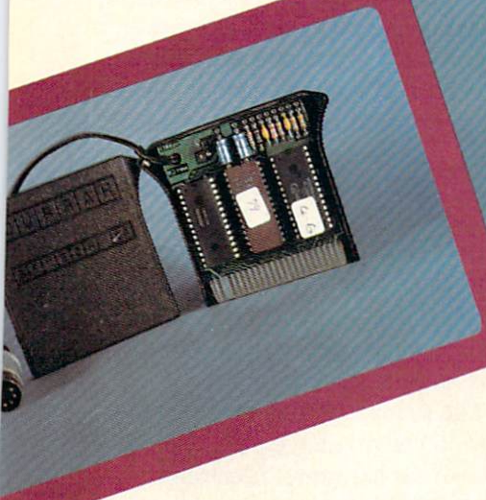
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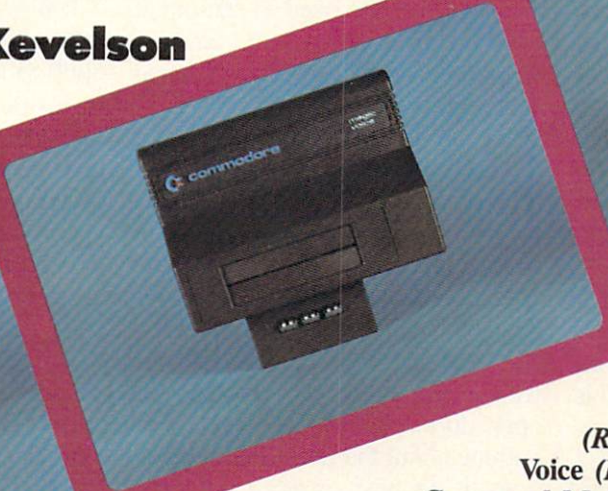
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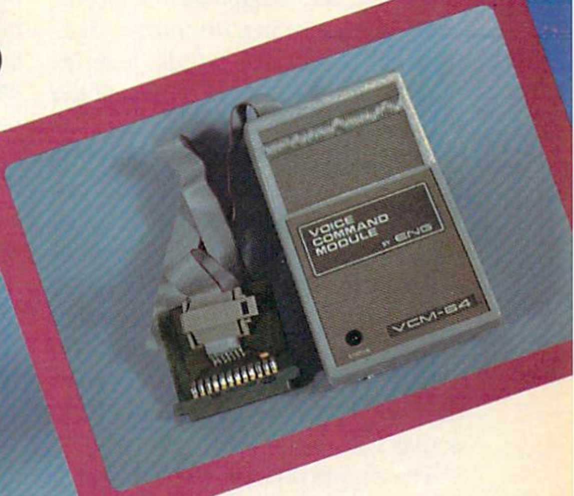
SPEECH SYNTHESIZERS

for the Commodore Computers

By Morton Kevelson







Left to right: Voice Messenger, *inside & out (Reader Service No. 282);* Magic Voice *(Reader Service No. 283);* Voice Command Module *(Reader Service No. 284).*

INTRODUCTION: SPEAK TO ME ONLY WITH THINE ?????

The ability to converse with the computer is uppermost in the minds of most users. The usual method of maintaining informative discourse involves tactile manipulation of the keyboard coordinated by visual stimulation via the video monitor. In other words, the user must bang away on the keyboard while paying attention to the video display. It doesn't take long to realize that the ability to indulge in verbal discourse with the computer could go a long way towards feeling up the tactile manipulators for other activities.

It isn't likely that the C-64 will ever attain the capability of a voice-activated typewriter. The technology for such applications just isn't with us yet, at least not in a $100 package. The C-64 does not have the speed or memory to handle that sort of voice recognition. However, there are several low-cost peripherals which will allow you the luxury of acoustic communication with your C-64. These products may be placed into two categories: speech synthesizers and speech digitizers. The former are self-contained devices, controlled by the computer, for simulating human speech. The latter create digitized images of the spoken voice for storage in RAM or on disk. These digitized images can subsequently be used for audible playback or, when properly processed, as recognition templates to permit verbal direction of the computer.

THE SOUNDS OF SPEECH

The human vocal apparatus is capable of producing two fundamental sounds. The vocal chords, essentially a vibratory apparatus, produce a buzzing sound. The fundamental, or lowest, frequency of this sound is in the order of 100 vibrations per second. The nature of this buzz is such that it contains a large number of harmonics, or integral multiples, of the fundamental vibration. These overtones, which vibrate at 200, 300, and so on times per second, are of nearly the same amplitude or loudness as the fundamental tone. A well-known example of this type of sound is the "ah" which is frequently produced as a slender sliver of wood is introduced into the mouth.

In contrast, the lungs are a source of compressed air, which when forcibly expelled produces a rushing sound. The random nature of this "white noise" contains a mixture of all audible frequencies. A common unvoiced sound is the "sh" used to represent a request for silence.

The audible output of these two mechanisms is controlled by the throat and mouth, which by the positioning of the tongue and lips form a highly adjustable resonating chamber. Each fundamental resonance so obtained is called a formant. These formants are combined into complex vibrations, known as allophones, which are the fundamental speech components. The allophones are further combined to produce the various vowel or consonant sounds known as phonemes.

SPEECH DIGITIZATION

The first method used to digitize speech stores the actual speech information. The production of sounds in the real world is a continuous or ana-

log process. That is, speech sounds change in a smooth and continuous stream. On the other hand, information stored and manipulated in a computer is done so in a discrete or digitized form. In other words, a series of numbers are used to represent the original information.

The process of converting real world information to digitized form is known as sampling. In effect, a real time event is looked at briefly at periodic intervals. The quantity being digitized is carefully measured and the results are stored away. Thus two pieces of information are required, the interval between samples and the actual value of the sample.

The degree of accuracy with which this is done depends on two things. The first is how often the original information is sampled. The second is the range of measurement which is available for each sample.

The sample rate sets an upper limit on how fast the original information can change and still be recorded with any accuracy. For example, if we want to make sure that we know the position of a door which might open or close once every second, we have to look at it at least twice every second. Less frequent observations would leave open the possibility of missing an opening or closing. Sampling theory agrees with this concept by specifying the need to sample at twice the maximum rate of change of the sampled signal. In terms of sound or speech, a faster sample rate results in greater fidelity.

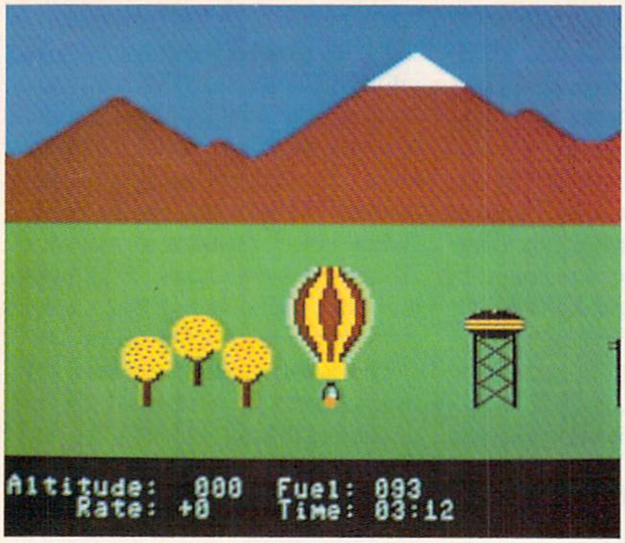
The measurement range determines how precisely each measurement is recorded. Using our door as an example, if we wish only to record if it is open or closed a single bit would suffice. In this case a 0 could represent a closed door, in which case a 1 would represent an open door. Of course this tells us nothing about the intermediate positions. If we wish to refine our measurement, say up to 256 different positions, a single byte would be required. In terms of speech or sound a greater range of measurement results in a greater spread between the loudest and softest sounds which can be recorded.

In music recording and playback equipment these two parameters are listed as the frequency response and dynamic range.

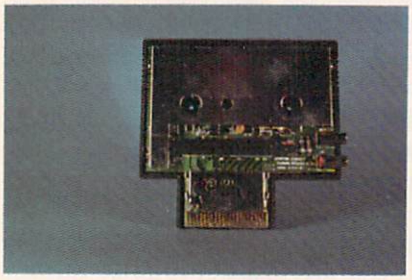
It turns out that for speech to be reasonably intelligible, a minimum of 3000 vibrations per second have to be heard. This would require a total of 6000 samples per second. If we use the same 256 possible levels, an understandable (although rather coarse) reproduction would result. In terms of computer memory, each sample would require one byte and each second of recorded speech would fill 6000 bytes of memory. Things aren't all that bad. Various mathematical compaction techniques have been developed to reduce the memory requirements somewhat. Nevertheless, speech reproduction in this way is memory intensive.

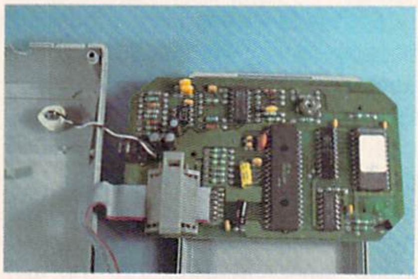
The second method of speech digitization turns a large part of the task over to the hardware. Electronic analogs of the vocal tract are constructed. A number of these circuits, representing the various positions of the vocal apparatus, are combined on a single chip. The task of speech production is reduced to controlling the speech circuits so as to reproduce the appropriate allophones. The problem of speech reproduction is thus reduced to one of selecting the appropriate circuits in the proper sequence for the correct lengths of time.

The data storage requirements for the hardware method are significantly less than for full digitization. Several tradeoffs exist. The hardware method is somewhat costly, although this is becoming much less of a factor. As with all semiconductor products, cost of the components are dramatically reduced after the initial development is complete. The most significant tradeoff is in flexibility. Digitization has the ability to record any sounds, not just the spoken word. The hardware devices are somewhat limited to a predefined set of acoustic characteristics. Both methods have



Aeronaut game included with Voice Command Module *requires you to direct the hot air balloon by voice rather than by keyboard or joystick. That is, you use your own hot air to manipulate the balloon's hot air.*





Interior views of Magic Voice *(left) and* Voice Command Module. *Note the two kilobytes of ROM and the onboard microprocessor in the latter.*

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their uses.

The reverse of speech digitization is speech recognition. The demands of a workable speech recognition system are far greater than those of a workable speech digitization system. In the ideal case, a speech recognition system would be both speaker independent and receptive of continuous utterance. That is, anybody could talk a blue streak at the computer and every word would be properly understood within the context of what was said. Even with the largest computer systems this is a yet-to-be-realized scenario.

A step down the difficulty ladder is a speaker-dependent continuous utterance system. These results may be achieved to a limited extent with existing hardware and software. The realm of the smaller computer is in the speaker independent discrete utterance field. That is, anyone will be understood, but only one clearly defined word at a time. In practice, most systems can be trained for a select group of individuals.

For the C-64 we come down to the speaker-dependent discrete utterance situation. That is, a select vocabulary discretely uttered by a single individual will be understood.

In actual practice a number of other factors must be considered. Perhaps the most important is the background or environmental noise which must be dealt with both during the training and recognition phases. Think of it as studying for a final exam in the cafeteria while actually taking the exam at a ball game. Things of this sort can drive the small system for a loop.

As Commodore users we are a fortunate group. The low cost and large numbers of our computers which are in use prompt the development of a large variety of inexpensive yet powerful peripherals. At a very minimal cost, speech products which perform many of the above functions are readily available. We will now examine a selection of these. □

MAGIC VOICE SPEECH MODULE
Commodore Business Machines, Inc.
1200 Wilson Drive
West Chester, PA 19380
Phone: 215-431-9100
Price: $59.95

No roundup of speech products would be complete without Commodore's own entry into the market. As is usual with Commodore products, the *Magic Voice* is an impressive piece of hardware for the price.

Connecting up the *Magic Voice* is straightforward if you are using a TV set. Just plug the module into the cartridge port and hook up the supplied audio cable between the module and the computer's video port. If you are using a monitor, things are a little more complicated. The audio connection to the monitor will have to be diverted to the *Magic Voice*. Audio for the video monitor is then supplied from the *Magic Voice*. A minimum of one and probably two user-supplied audio cables are required.

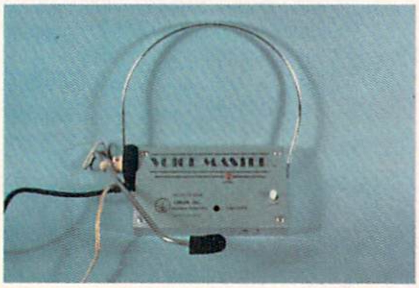
The *Magic Voice* speech module places its priorities on the production of clear, natural-sounding speech. To achieve this goal, Commodore has chosen to limit the module's repertoire to a total of 235 different utterances. The majority of these speech fragments are entire words, of which 25 per cent are devoted to the letters of the alphabet, numbers, and numerical suffixes. This last set provides enough flexibility to allow the user to SAY any number up to 999,999,999. Speech is produced in a realistic female voice with just a hint of an "accent."

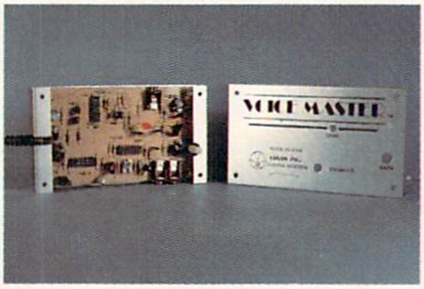
Attaining a high level of intelligibility is not without a price. The storage requirement for this limited vocabulary and its associated driver software exceeds 16 kilobytes. The bulk of this data is the speech module's resident vocabulary. Fortunately, the Commodore 64's architecture supports the acquisition of operating system extensions without affecting BASIC's user RAM. The speech extensions are mapped into the address space which is shared by the computer's built-in BASIC and operating system ROMs. Only one kilobyte, in the $C000 block, is visible to BASIC. This area is normally reserved for machine language subroutines.

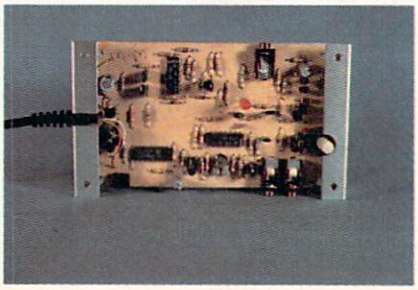
The voice module consists of a compact, enclosed plastic package which is installed in the Commodore 64's cartridge port. A set of hinged doors on top of the cartridge covers a spare socket which permits the use of additional cartridge-based software. Only an audio hookup is needed to complete the connection.

The addition of four commands to BASIC allows for simple programming of the device. The SAY command works very much like a print statement. It is limited to single words in the resident vocabulary or to the numbers 0 through 234, each of which corresponds to one of the available utterances. Thus, the rendition of complete sentences requires successive SAY statements.

The most significant shortcoming, aside from the limited vocabulary, is







Voice Master *has both speech digitization and recording capabilities. The accompanying headset/microphone simplifies recording of voice patterns.* *READER SERVICE NO. 285*

BASIC's error routine. Any attempt to voice an utterance which is not part of the resident vocabulary results in the cessation of program execution and the display of the ?ILLEGAL QUANTITY ERROR message. A far more practical approach would have been to simply ignore the offending phrase or perhaps to utter a non-committal grunt. Fortunately, a simple out exists. POKE 49457,76:POKE 49458,174:POKE 49459,167 will harmlessly redirect the error routine.

The built-in RATE command varies the speed of the spoken word over a two-to-one range without affecting the voice's pitch. The RDY variable allows BASIC to test the speech module for completion of the current phrase. The VOC function alerts the module to any vocabulary extensions in user RAM.

TABLE OF BASIC EXTENSIONS

Magic Voice

SAY "text" or A$ or N—utters text string or number

RATE (I)—sets speech speed

VOC (AD)—defines user speech dictionary

RDY—*Magic Voice* status variable

- **text**=utterance in *Magic Voice* vocabulary
- **A$**=string variable
- **N**=utterance number from *Magic Voice* vocabulary
- **AD**=address of vocabulary data
- **I**=1(fast) to 10(slow)

Do not expect to be able to encode your own vocabulary. The complexity of the process will force most users to depend on outside sources for supplementary vocabularies.

The *Magic Voice* has been around for some time now. When first introduced, numerous promises were made about the new games and software which would soon be available to support it. Aside from several cartridge-based games, very little if any of this software has materialized. This is a shame, as the *Magic Voice* has a great deal of potential.

The *Magic Voice* comes with a reasonably detailed manual complete with a sufficient number of programming examples. For the advanced user, a chapter on interfacing to the machine language routines is included. □

THE VOICE MESSENGER-SPEECH 64
Welwyn Currah Ltd.
104 West 4th Street
Royal Oak, MI 48067
Phone: 313-547-8300
Price: $59.95

The *Voice Messenger-Speech 64* offers a generalized approach to computerized speech. All speech is generated by combining allophones, the basic speech components. These consist of 58 speech sounds with four pauses of varying lengths. The resulting speech is quite intelligible with just a bit more "accent" than the *Magic Voice.*

Installation is as simple as plugging a cartridge into the expansion port. If you are using a TV, just plug the attached cable into the computer's video port. If you are using a video monitor, use the included "Y" adapter. We did discover an interesting quirk. If a disk drive connected to the serial port is not turned on, the *Voice Messenger* will not work. Either turn on the drive or disconnect it while using the *Voice Messenger.*

The user is not required to combine allophones to generate speech. The *Voice Messenger* has its own eight-kilobyte operating system which does a commendable job of translating ordinary text into speech. The SAY command, which has been added to BASIC, will convert any string or string variable. If the pronunciation is not to the user's liking, it is a simple matter to tweak the vocalization by modifying the spelling. The translator will also accept a mix of text and allophones for maximum flexibility.

The only limitation to be aware of when voicing speech is the 256-allophone speech buffer. In real time this amounts of about 25 seconds' worth of speech. In computer time the buffer can be filled in just a few milliseconds. The reserved variable, SP%, allows the BASIC programmer to test the status of the speech buffer.

The *Voice Messenger* will also convert the Commodore 64 into an instant talking computer. The KON command causes vocalization of all keystrokes. All keys are sounded, including the function keys, with the exception of the CTRL, RUN/STOP, Commodore logo, and RESTORE keys. The Commodore graphic symbols are simply sounded by the word "graphic." Priority is given to the most recent keystroke, which cancels the sounding of the last keystroke in mid-utterance. Pressing the keys faster than they can be uttered results in a peculiar echo effect.

Speech is normally sounded by a distinctly male tenor voice. The pitch may be easily altered to a rich baritone. The intonation of either voice can be subtly varied when direct allophone voicing is used. The clever programmer can add considerable expression to the generated speech. .

The *Voice Messenger* operating system does not utilize any of the Commodore 64's BASIC memory space. Some memory locations in the $C000 block are used. A brief manual is supplied with the package. The commands are clearly described along with several examples. For advanced programmers, a chapter on the machine language interfacing is included.

A required DIN plug "Y" adapter, not included with early production models of the *Voice Messenger*, now comes packaged with the hardware.

The *Voice Messenger* is a good all-purpose speech synthesizer for the Commodore 64. Its performance flexibility and reasonable price make it a best buy. ☐

Voice Messenger

INIT—initializes voice messenger
SAY n "text" or n A$—utters text string with specified voice
KON n—key voicing on
KOFF—key voicing off
BYE—suspends *Voice Messenger*
SP%—speech buffer status variable
A$=string variable
text=any text data
n=0 or 1; 0=low voice, 1=high voice

EASY SPEECH 64

Research In Speech Technology, Inc.
1825 74th Street
Brooklyn, NY 11204
Phone: 718-232-7266
Price: $24.95

It appears that we have discovered a genuine cottage industry (at least in what passes for a cottage in Brooklyn) right in our own backyard. Research In Speech Technology (RIST) has been dealing in personal computer speech products for several years. Until now they have been content to use indirect marketing to distribute their wares. RIST will now be offering, direct to the consumer, their own line of speech products.

The first of these, *Easy Speech 64*, is a disk-based utility designed to work with the Welwyn Currah *Voice Messenger*. In fact, you must have the *Voice Messenger* to derive any benefit from *Easy Speech 64*. If you have met the basic requirements, then *Easy Speech 64* can be set to automatically vocalize any text sent to the Commodore 64 screen or any other output device. This sleight of mouth is accomplished by intercepting all output as it is sent to the screen for display. Text is then vocalized in real time.

Easy Speech 64 is designed to be as transparent as possible to the normal workings of the C-64. The bulk of the code resides in the RAM which is hidden beneath the Kernal ROM ($E000-$FFFF). As a result *Easy Speech* will function with many commercial software packages. Most notably, it will work with the entire line of Infocom interactive fiction software from the original *Zork* to the latest *Wishbringer*. Just initialize *Easy Speech 64* and then boot the adventure game as per Infocom's instructions. Everything works as before, except every word is clearly enunciated in the *Voice Messenger*'s own peculiar accent.

The alert reader will realize that text is often displayed at a rate which is far greater than that of the spoken word. Herein lies the most significant disadvantage of the system. Operation is slowed up considerably when *Easy Speech 64* is active. The solution is quite simple. *Easy Speech 64* may be toggled on and off by a CTRL V (for voice) keystroke sequence.

Installation of *Easy Speech* is straightforward. Simply boot the program from disk. After a lengthy and unavoidable message, which is accompanied by the display of a talking disk, the main menu appears. At this point you have the option to accept the defaults and run your application software or customize *Easy Speech*. Upon choosing the latter, the modify menu appears, offering four possibilities:

1. The default device can be changed to anything from 1 to 255 (the screen is device 3). Thus text being sent to the cassette, printer, or disk drive can be vocalized. This may not even slow things down if you are using the cassette or a letter quality printer.

2. The memory location of the *Easy Speech 64* operating software can be changed to the RAM under BASIC ($A000-$BFFF). This provides some flexibility to accommodate additional commercial software.

3. If you are not happy with the tone of *Easy Speech 64* you can do something about it. The default is a low voice in a high pitch. An optional high voice and low pitch can be selected for a total of four combinations. These are two separate selections on the customize menu.

4. The most powerful option is the dictionary. This lets you customize the pronunciation of the words which are important to your application. Actually, entire phrases can be entered into the dictionary for subsequent recall by PRINTing a single character. This can be a significant memory saver for your BASIC programs. Over four kilobytes of dictionary space is available in the RAM under the ROM. An unlimited number of dictionaries can be stored on disk.

Dictionary entries are created with *Easy Speech*'s own custom editor. The screen is divided into three windows. The top window is for direct entry of text. Although the manual indicated a 67-character limitation, we found the editor would accept text of any length. *Easy Speech* includes a sophisticated algorithm to translate

most text into the appropriate allophone for use by the *Voice Messenger.* Simply hit return and the allophone version of the text will appear in the second window. Of course, it is impossible for it to be 100% perfect. At this point you can voice the message and modify the allophones to fine tune the speech. Alternatively, the text entry stage may be bypassed to direct allophone entry.

The bottom window displays the available editor commands in abbreviated form. The window also displays user prompts when required. Four built-in help screens provide a slightly more detailed description of the commands, as well as an annotated listing of all the available allophones.

The editor worked well once we became accustomed to its unique conventions. The allophone window would only accept genuine allophones and not arbitrary text. Full disk support is provided, including the loading and saving of dictionaries, directory display, and the issuance of disk commands. The editor did have several nonfatal flaws. It was all too easy to exit the editor without adding the current phrase to the dictionary. This results in the loss of whatever was in the editor's buffer. Although the editor listed the word identification in the dictionary, it did not permit the recall of an added phrase for further editing.

Once you have left the modification mode, *Easy Speech* parameters are fixed. There is no way to remodify any of the parameters without rebooting from the very start. None of these limitations detracted from the overall performance of *Easy Speech.* In general they are easily circumvented if you are aware of their existence.

We were disappointed in one aspect of *Easy Speech*, the vocalization of BASIC program listings. In the ideal case, the online text to speech converter would read back a program as it LISTs to the screen. This would enable you to proofread a program without the need for constant head swinging between the screen and the source code. Unfortunately, the text to speech algorithms were not up to the task of decoding a BASIC program. Characters which are crucial to BASIC (such as punctuation symbols) as well as key words and BASIC variables were all vocalized as normal text. The results were rather strange and of little value for proofreading. What is needed is a custom dictionary which examines the BASIC tokens stored in memory. In addition, all BASIC text would have to be vocalized one character at a time. We did pass these suggestions on to RIST. Perhaps some favorable results will be forthcoming.

Easy Speech 64 is a very useful utility. If you already have the Welwyn Currah *Voice Messenger,* you should definitely consider the purchase of *Easy Speech.* ☐

COVOX VOICE MASTER
Covox Inc.
675-D Conger Street
Eugene, OR 97402
Phone: 503-342-1271
Price: $89.95

The *Voice Master* system from Covox, Inc. is a combination of hardware and software for the digital recording of speech and sound with the Commodore 64. The digitized data is initially stored in the computer's memory and may be saved to disk for subsequent playback.

The package includes a compact hardware module about the size of a pack of cigarettes. Early versions of the *Voice Master* were installed in the user port. These were supplied with a simple hand-held microphone. More recent versions plug into the joystick port, leaving the user port free for other applications. A combination headband with earphone and microphone are presently supplied with the package. The latest versions are very similar to the one depicted on page 36, the primary difference being the elimination of the calibrate adjustment.

Early versions also used a single analog to digital integrated circuit conversion chip. Current models utilize more common integrated circuits, which seem to perform just as well. The hardware module is needed only for the recording of speech or sounds. Reproduction of digitized speech is via the Commodore 64 SID chip. Once the speech files have been digitized and saved to disk, they may be recalled for use by user-written programs. The only requirement here is that the *Voice Master* software (see below) must be LOADed into the computer.

The heart of the system software is a four kilobyte machine language program which LOADs into the $C000 block. The major memory overhead is associated with the storage of the digitized sound data or vocabularies. The specific amount of memory available for speech data is user-adjustable. The minimum amount uses the RAM under the BASIC ROM. About six kilobytes or six seconds of speech is thus available. It is possible to allocate a maximum of 41,140 bytes for speech data storage.

The operating system includes a fast LOAD routine which makes possible the use of the disk drive for real time vocabulary storage. The fast LOAD

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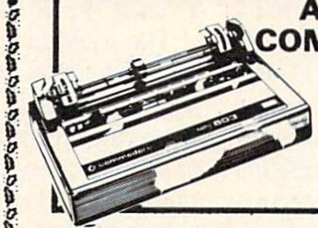
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routines may not be available on versions sold outside of North America.

The software extends the Commodore 64 BASIC with 18 new commands. These allow for very easy programming of the Commodore 64 for the recording and playback of digitized sound. For example, LEARN 5 records the next sound as phrase number 5. SPEAK 5 will play back the sound. As with other BASIC functions, the parameters may be explicitly defined or may consist of any BASIC expression. A total of 64 phrases may be addressed.

Disk or tape storage of the phrase file is by the PUT and FIND commands. These are analogous to SAVE and LOAD; however, they affect only the digitized sound data. The remainder of the commands allow easy adjustment of the recording and playback parameters, including sampling rate, playback speed, and volume.

The sample rate as set by the RATE command is important. The allowable range is from a minimum of 4,000 up to a maximum of 12,500 samples per second. The tradeoff is fidelity versus memory. The higher sample rates give better reproduction, but use up memory at a proportional rate. We found that voices were easily recognizable even at the slower rates.

Included with the software are several sample programs that demonstrate the use of the new BASIC commands. Among these are a talking alarm clock and calculator. Also demonstrated are the ease with which special effects can be created, such as generating echoes. Some of the demonstration programs are also used to adjust the hardware. The BAR program is a rudimentary spectrum analyzer which is also used to calibrate the gain or volume control. A spectrum analyzer is an instrument used to display the frequency content of a signal. Unfortunately, the version supplied was too crude for any serious use, although it did make for an effective display.

In use, the package performed well. Individual voices were clearly understood and easily recognizable. Voice quality was slightly harsh due to the limitations of the SID chip. Best results were obtained with the screen blanked. Overall, the speech quality is quite good when compared with dedicated speech synthesizer devices. Even if we do say so ourselves.

The package includes speech recognition software, which performed surprisingly well. However, it did require some practice on the user's part to achieve consistent results. The important thing is to train your voice to repeat the key words in exactly the same way. As with the speech digitization software, the speech recognition routines have their own BASIC commands. These include special TPUT and TFIND commands for SAVEing and LOADing templates.

A special digitization process reduces each spoken phrase to a template which is only 96 bytes long. Thus real time manipulation of speech recognition templates is possible.

Three versions of the machine language routines are supplied. These consist of separate and combined versions of the speech digitization and recognition software. This allows the user to optimize the use of memory to suit the needs of the application. All commands also work under program control. All commands also work under program control. This makes it feasible to write a program which will LEARN a user's voice, be TRAINed to recognize it, and respond in kind when spoken to.

User documentation is thorough, with numerous examples. The demonstration programs may be listed for further study. The machine language routines can be disassembled. We would have preferred to see a commented source code listing as well. A detailed technical manual for the more sophisticated user would be a welcome addition. This would allow the technically inclined to experiment with other aspects of the *Voice Master* package. For example, although intended for speech applications, the hardware could be trained to recognize many other types of signals as well. Virtually any measurable parameter, when converted into a properly scaled electrical signal, could be fed into the microphone port.

The Covox *Voice Master* is a flexible, easy-to-use package. Many applications readily suggest themselves. The samples supplied with the package are a good place to start. The included *Voice Harp* is a case in point. This three-part program lets the computer sing along with you as well as compose music and print out the resultant score—all under your vocal direction. Just be careful with the volume setting on the video monitor. If it is too high, the microphone will pick up the generated sound. The result is the computer literally singing to itself.

Perhaps some day, with the help of the *Voice Master* or products like it, digitized voice libraries of famous personalities will be possible. So watch out, the person answering the phone may not be who you think. □

COVOX BASIC

Speech Digitization

LEARN n—digitizes spoken word
SPEAK n—voices digitized phrase (n=0...63)
SPEED m—varies playback rate
RATE m—varies sample rate (m=0...10)
VOLUME k—playback volume (0...15)
PAUSE k—delay in ¼ second increments (0...255)
SCREEN k—screen on or off
PUT "name",dn—saves vocabulary
FIND "name",dn—loads vocabulary
FFIND "name",8—fast load (dn=device number)
CLEAR n—clears all speech, sets page for recording (16...160)

Speech Recognition

TRAIN n—records a template
BLANK n—erases a template
RECOG m—scans range of templates for a match (m=0...4, n=0...31)
TPUT "name",dn—saves a template
TFIND "name",dn—loads a template
MIN n—sets recognition threshold lower limit (0...100)
MAX n—sets recognition threshold upper limit (0...700)

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VOICE COMMAND MODULE (VCM-64)
Eng Manufacturing, Inc.
4304 W. Saturn Way
Chandler, AZ 85224
Phone: 602-961-0165
Price: $49.95

The *Voice Command Module* from Eng Manufacturing, Inc. is a combination of hardware and software that adds speech recognition capabilities to the Commodore 64. The word recognition "lexicons" are initially stored in the computer's memory and may be saved to disk for subsequent use. Unlike any of the other speech products we looked at, the *VCM-64* has no capability to generate digitized speech.

The package includes a compact hardware module about the size of a large pocket calculator and disk-based software. The module connects to the C-64's user port via a three-foot length of ribbon cable, terminated with the appropriate edge card connector. The arrangement leaves a number of electrical contacts exposed at the rear of the computer. These could be shorted out by a carelessly placed object. A short length of insulating tape, wrapped about the connector card, should eliminate the hazard. For voice recording a miniature microphone with a lapel clip is included in the package.

Internally, *VCM-64* displays a high degree of sophistication. The module contains two kilobytes of ROM and an onboard microprocessor. The module does all the speech preprocessing before passing the data along to the computer. This minimizes the data processing requirements of the C-64 itself. As we shall see, the Speech Operating System inside the computer requires a minimum of memory.

The heart of the system software is a four kilobyte machine language program which LOADs into the $C000 block. The major memory overhead is associated with the storage of the digitized sound data or speech recognition lexicons. Each lexicon includes a maximum of 64 unique words. The maximum length of a word is 1.28 seconds. The data for each word requires exactly 128 bytes. Thus an entire lexicon fills eight kilobytes. Since lexicons are LOADed into the RAM beneath the BASIC ROM (the C-64's $A000 block), all of BASIC memory remains available for the user. Lexicons are always exactly eight kilobytes. If there are fewer than 64 unique words in a lexicon, the software will train more than one pattern for each word. Thus a single word lexicon will contain 64 versions of the word.

The software does not add any commands to the Commodore BASIC. Instead, a general utility program, the Speech Operation System (SOS), is included on the disk. This menu-driven routine, written in BASIC, provides a user interface to the machine language operating system. It lets the user easily create and manipulate lexicons for later use. The menu-driven functions include routines to copy and modify lexicons, as well as train and rehearse lexicons.

In addition to the SOS, several demonstration programs are included. All programs are accessed from a menu-driven loader. All the programs, which are speech-driven, require that a command lexicon be created by the end user. Included are a simple card file, a hot air balloon aeronaut game, and a word mix puzzle.

We derived considerable amusement from the aeronaut game. Although simple and unsophisticated, the uniqueness of directing the balloon by voice, rather than keyboard or joystick, resulted in considerable interest by our game testers. Particularly amusing was the body English employed as commands were given in a carefully controlled voice. Due to the limitations of the system, spoken commands must bear a high resemblance to the utterances as they were originally trained.

Among the demo programs is the Speech Graphics display generator. This generates a graphical representation of a spoken word. This snapshot is related to the format which is used by *VCM-64* for creating the word recognition templates. The program allows the user to compare repeated utterances of the same word. We found the routine to be of some assistance in training the end user for uniform repetition of command words.

Using speech recognition in your own program is not difficult. Although *VCM-64* lacks any extensions to BASIC, the speech recognition features are easily accessed by a series of PEEKs, POKEs, and SYS calls. These allow the user to initialize the system, LOAD a lexicon, and listen to an utterance. All calls are done to location 50000 as follows:

```
SYS 50000,I: initializes system
SYS 50000,L: LOADs a lexicon
SYS 50000,F: recognizes utterance
```

The LOADing of a lexicon must be preceded by the OPENing of the lexicon file. The results of an utterance recognition are stored in series of memory locations starting at address 53000. These have to be examined by the user.

The accompanying manual described all of the above operations in some detail. Unfortunately, the accompanying example contained several significant errors. Fortunately, sufficient detail was included to allow a reasonably competent BASIC programmer to figure out what to do. Overall, the documentation was clear and concise. Use of the various demonstration programs and utilities was well-explained. Our biggest beef with the documentation is the lack of technical detail for what is actually an experimental product. Given the wide range of possible applications and the unusual technology, we felt that an educated user would be a better customer.

We encountered one additional bit of misdirection. The machine language program, which is the heart of the system, is referred to as "CHIRPEE" by all the documentation. In fact, the label on the back of the *VCM* is so marked. This file did not exist on the distribution disk. Instead the main program was listed as "VCM."

Overall, *VCM-64* is an interesting product. Speech recognition depended a great deal on the user's ability to voice commands in a repetitive manner. Once this trick was mastered, *VCM* performed acceptably. ☐

THE YEAR'S BEST COMMODORE ENTERTAINMENT SOFTWARE

Here Are 1985's Top 25 Games and Recreations

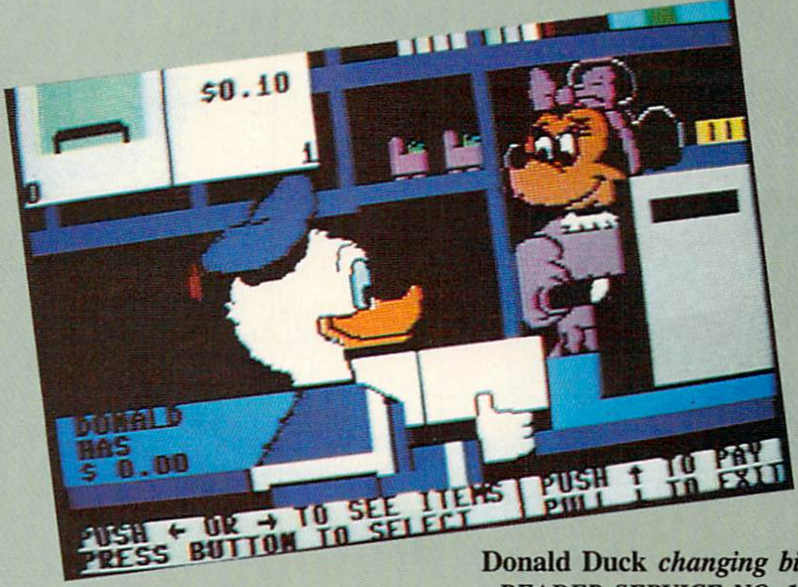
By the *Ahoy!* Editorial Staff



Airwar made easy.
READER SERVICE NO. 153

Looking back on 1985's array of new programs should put broad smiles on the faces of Commodore owners. It was quite a year, perhaps the best in the history of computer entertainment software. Electronic publishers took dead aim at the huge Commodore audience and broke all records for both quality and quantity.

The writers who cover entertainment for *Ahoy!* have collaborated on this survey of the 25 best leisure programs. The compilers beg the indulgence of readers whose favorites are omitted and publishers whose worthy titles appeared too late to make the deadline. Such are the perils of "best" lists.



Donald Duck ***changing bills.***
READER SERVICE NO. 154

Strategy

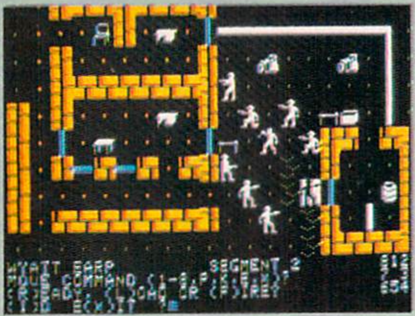
At one time, virtually all strategy games were military simulations. Computer wargames are still very popular, but there's now a wider variety of subject matter.

There are two distinct types of strategy contests, both of which are represented among 1985's best programs. Traditional strategy games let the players think as long as they want, while action-strategy contests require the player to concoct tactics to deal with more fluid situations.

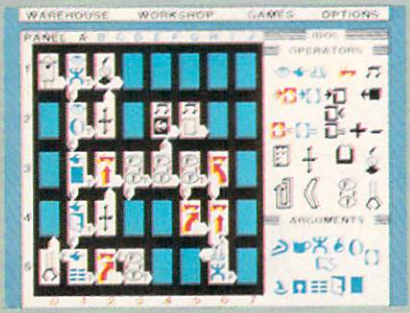
Field of Fire (Strategic Simulations). Designer Roger Damon has created an unusually compelling military simulation by adding an element of role-playing to the fighting. The solitaire commander can gain insight into small unit actions during World War II at the head of Easy Company of the U.S. Army's First Division. Eight scenarios follow the glory road from North Africa to Europe. *Field of Fire* can be played as a single engagement or as a campaign which strings all eight battles together. The gamer can rename individual characters to put the conflict on a more personal basis.

Felony! (CBS Software). *Murder by the Dozen* earned praise as one of 1984's best strategy programs. The sequel smooths out the (few) rough edges of the original, and boasts a greater variety of cases to tickle the wits of would-be investigators. A dozen crimes, from vandalism to gangland murder, are baffling the Huxley police force. The mayor is putting the screws to the boys in blue to catch some crooks. *Felony!* is equally enjoyable solitaire or with up to four sleuths. As a detective moves around Huxley, he or she selects lines of inquiry from onscreen menus. The investigator deciphers the coded responses with the special clue book. Anyone who loves a rousing mystery should book passage to Huxley without delay.

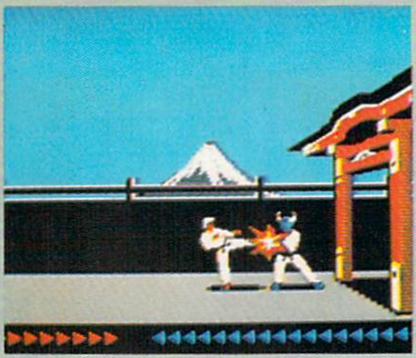
Mail Order Monsters (Electronic Arts). This one- or two-player action-strategy program makes the gamer the owner/manager of an array of



Six Gun Shoot-out: ***slap silicon.***
READER SERVICE NO. 155



Chipwits: ***enjoyable programming tutor.***
READER SERVICE NO. 156



Karateka: ***combat in various styles.***
READER SERVICE NO. 157

fighting creatures which even professional wrestling's Vince McMahon Jr. would envy. The confrontations take place in a variety of settings, each of which aids and hinders the contestants in a different way. There are three variations of the game. The beginner's level teaches the rules, the intermediate game focuses on single battles and the tournament is an extended contest involving stables of morphs. Victory points can improve a monster's abilities and equipment. The super-powered battling will excite younger computerists, while the interplay of tactics and the ability to customize the creatures make it just as suitable for adults.

Six Gun Shoot-out (Strategic Simulations). One or two gunslingers can relive 10 scenes drawn from the history and folklore of the Old West. Participants can play a stock situation such as the Gunfight at the O.K. Corral, modify any or all of the characters, or let the computer assign random values. There's even an easy method for designing original scenarios. Those who crave direct participation can enter the fracas as a substitute for any existing character. Onscreen prompts make order entry surprisingly fast, even in scenarios with many characters. *Six Gun Shoot-out* hits the entertainment bullseye.

Squire (Blue Chip Software). Tired of hearing radio's financial advisors dispense wisdom? Jim Zuber's detailed simulation, the fourth in the series which includes *Millionaire, Baron,* and *Tycoon,* makes a fascinating game out of comprehensive financial planning. *Squire* challenges the player to accumulate a retirement nest egg of $1,000,000 by trading stocks, commodities, collectibles and other investments. Each turn, the computer presents charts, graphs, and tables which outline the situation and provide the backdrop for the wheeling and dealing. Those who make their million can try the ultimate test: playing *Squire* using the computerist's real-life financial statistics.

Spy vs Spy: The Island Caper (First Star Software). Antonio Prohias' madcap spies return in a sequel that's even better than their first outing. The adversaries must search an island for three pieces of a secret missile. They battle natural hazards, fiendish traps, and a time limit to assemble the pieces and catch the submarine for home. The simulvision windows pan as the spy moves around the island instead of jump-cutting from location to location, and the pseudo-3-D graphics are even better than in *Spy vs Spy.*

Adventures

Gamers aren't complaining, but the traditional trickle of new Commodore adventures became a tidal flood in 1985. Manufacturers introduced more adventures for the C-64 last year, considering both new designs and translations, than in any previous 12-month period.

The Fourth Protocol (Bantam Electronic Publishing). This icon-driven adventure employs characters and situations from Frederick Forsyth's 1985 novel of the same name. Agent John Preston is the only man in Great Britain who scents a nuclear plot which could shatter the delicate balance of world power. Preston must uncover the identity of the double-agent in the British government, then locate the miniature atomic bomb and finally disarm it. The icon-based interface facilitates fast play and eliminates the need to type lengthy orders.

Hacker (Activision). This joystick-controlled adventure plunges the gamer into the heart of a high-tech conspiracy. A freak accident throws the player into a secret computer network controlled by Magma, Ltd. Bit by tantalizing bit, the hacker learns about both the corporation's reckless scheme and a secret report which can blow the lid off the whole operation. Unfortunately, spies all around the world have acquired pieces of the document. The gamer uses a scout robot to visit these agents and buy or trade for the pieces. The trick is to learn what form of payment each spy wants. The simple control system, excellent graphics, and animated tunnel sequences keep *Hacker* fun to play again and again while the computerist gropes for the perfect strategy.

Mindshadow (Activision). The search for one's own lost identity is a staple of fiction. The same intriguing premise is the mainspring of this illustrated adventure designed by Interplay Productions. The protagonist, an amnesiac, must first find a way off the depressingly barren island. Shock follows shock in quick succession as the hero journeys around the world in the hunt for the secrets of his own past. A unique feature of *Mindshadow* is the "think" command. It is used to test any newly encountered person, place, or piece of information to see if it sparks any mental images. The situations in *Mindshadow* are exceptionally logical, though a

few are complex enough to keep veteran adventurers scratching their heads for awhile.

Sherlock Holmes in Another Bow (Bantam Electronic Publishing). Increased memory capacity has made possible adventures, like this Victorian mystery, which combine illustration with extensive text. The player becomes Sherlock Holmes, whose exploits aboard an ocean liner are recounted in excellent novelistic prose. Dr. Watson is at the detective's side, offering help. The cases aren't really that tough, but there are a lot of them to solve before the ship docks in America.

Recreations

Games are still the most popular type of entertainment software, but there's more than one way to have fun with your Commodore computer. Many computerists enjoy recreational software because it's interactive and mind-stretching without the tension of competitive contests.

Art and music programs ruled this category last year. Publishers grew more venturesome in 1985 and marketed recreational programs on subjects ranging from model railroads to electronic paper dolls.

Adventure Construction Set (Electronic Arts). The foremost author of action adventures, Stuart *(Return of Heracles, Ali Baba)* Smith has made it possible for any reasonably imaginative computerist to design a science fiction, fantasy, or mystery adventure without any knowledge of programming. The instruction booklet and playable tutorials provide ample instruction for producing an action adventure game, complete with graphics and music. Smith has refined and upgraded almost all the subsystems familiar to fans of his earlier hits, so the *Adventure Construction Set* can produce games which are as good as professionally published titles.

The Complete Computer Fireworks Celebration Kit (Activision). Parents who fear Fourth of July accidents would do well to buy this disk for their kids, though they'll probably end up elbowing the youngsters away from the console. The computerist picks choices from menus to orchestrate a fireworks show, including music and special messages. The frame-by-frame construction system makes the process surprisingly simple. *The Complete Computer Fireworks Celebration Kit* even produces animated greeting cards which run on any Commodore 64 or 128 without the original program.

The Little Computer People Project (Activision). This unique cross between a doll house and an ant farm turns the monitor into a window to another world. The computerist observes, and periodically interacts with, a charming electronic family which "lives" inside the Commodore 64. The lifestyle of the computer people unfolds a little at a time over a year. For instance, the digital lord of the manor may start fooling around with a saxophone. After doing this a few times, he "learns" to play a tune. And if his rehearsals go well enough, eventually another musician enters the house and makes it a duet. The little computer people can do nearly 5,000 different things, and there's a supplemental disk already in the works.

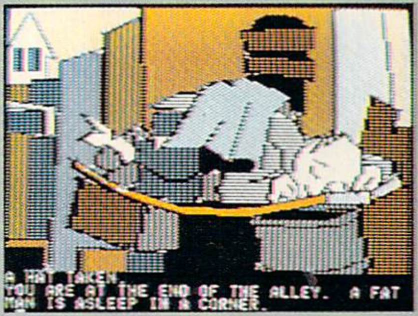
Educational Games

Realism returned to the educational games market in 1985. Publishers have stopped over-producing ho-hum titles, a trend which swamped this category in 1984. This year's best entertain as they inform.

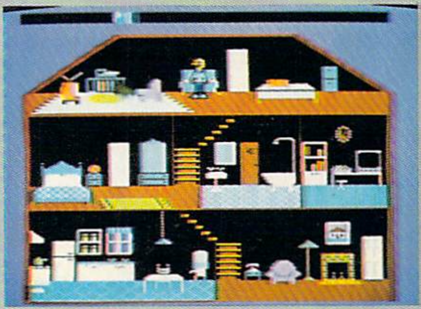
Chipwits (Epyx). This fascinating solitaire game transcends its original purpose: to teach the rudiments of programming. The user designs a tiny onscreen robot to deal with the conditions of an environment and then runs the miniature automoton through one of several obstacle courses. "Educational" can be the kiss of death when applied to an entertainment product. *Chipwits* does teach, but it never lets the lesson cut into the mind-stretching fun.

The Halley Project (Mindscape). Comet fever is spreading as Halley's pet rock swings toward the earth for its second and last visit of this century. This one-player space piloting game capitalizes on public interest in this astronomical event to teach the constellations. It's exciting to fly the missions from Halley's Comet to each major planet, and the navigation process guarantees that any spaceship captain will know the names and configurations of all the major star groups after a few interplanetary trips.

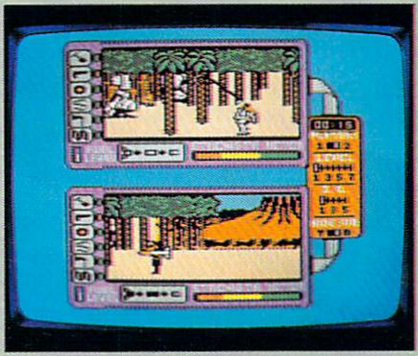
Donald Duck's Playground (Sierra). Teaching youngsters about money is the object of this beautifully designed program. Ages 7 to 11 use the joystick to manipulate a well-drawn version of the famous Disney quacker as he tries to get playground equipment for his nephews. Donald must do odd jobs to earn the money with which to buy swings and teetertotters. Be-



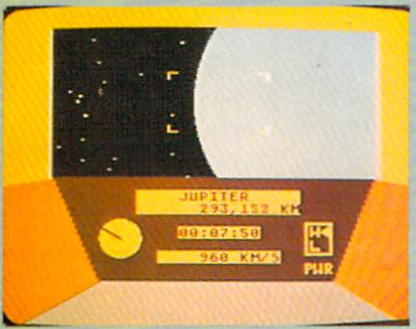
Mindshadow ***has "think" command.***
READER SERVICE NO. 158



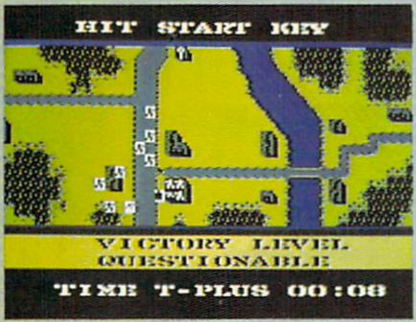
Little Computer People ***in your C-64.***
READER SERVICE NO. 159



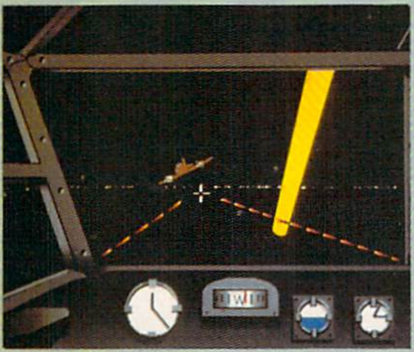
Island Caper: ***new avian intrigue.***
READER SERVICE NO. 160



Halley Project: *scrutinize the stars.*
READER SERVICE NO. 238



Field of Fire: *combat role-playing.*
READER SERVICE NO. 239



Dam Busters: *recreates WWII air raid.*
READER SERVICE NO. 240

sides instilling an appreciation for the Work Ethic, the grade schooler learns how to make change. *Donald Duck's Playground* meets the essential criterion of a great educational game: it is entertaining enough to keep the student interested in learning the lessons it teaches.

Sports

On-Court Tennis (Gamestar). The world of computer entertainment, which began with *Pong,* comes full circle with this one- or two-player action strategy program. The differences between these two titles shows how far electronic gaming has come in the last 15 years. The program moves each onscreen athlete into position to return a volley, but the computerist picks the shot with the joystick. Cleverly implemented artificial intelligence gives each of the racqueteers a unique personality and style of play.

On-Field Football While the computer football programs aspire to Super Bowl realism, this one- or two-player game evokes the anything-can-happen atmosphere of sandlot football. One or two coaches use the joystick to develop a variety of offensive and defensive plays for their four-man teams. Artificial intelligence endows onscreen athletes with individualized abilities. For instance, the gamer can choose possession receiver "Hands" Hannah or flyer "Legs" Lancer to play split end. *On-Field Football* is an easy-to-play blend of exciting action and gridiron tactics.

Micro League Baseball (Micro League Sports Association). Every baseball fan secretly dreams of piloting the home team to the pennant. This statistical replay game lets every armchair manager grapple with the same strategic and tactical questions which bedevil Tommy Lasorda and Earl Weaver. Each athlete in *Micro League Baseball* is a mathematical model of his real-life counterpart, but *Micro League* is more than just a number-cruncher. Excellent graphics buttressed by charming animation make *Micro League Baseball* a delightful play experience, even for those who don't eat, sleep, and dream hardball.

Summer Games II (Epyx). Eight great events make this a worthy follow-up to the award-winning *Summer Games.* From the lavish opening sequence to the new closing ceremony, *Summer Games II* is fast-action thrills with enough strategy to make it fun to play again and again. An excellent feature is that this program can be linked to the original so that participants can compete in a grand tournament of all 16 events.

Super Bowl Sunday (Avalon Hill). Twenty great Super Bowl teams of the past are ready for one or two computerists to coach in this statistical replay football simulation. Menu-driven play-selection gives both offense and defense a wide variety of options, but doesn't require nearly as much memorization as comparable programs. Quest, the design team responsible, didn't neglect the visuals. After both sides enter their orders, full-screen animation shows the result. Additional disks, available for separate purchase, expand the range of available teams.

Action

The fall of the Videogame Era also signalled the end of the vogue for action contests. Even two years later, the quantity of action games is still well below the 1983 peak.

Action programs are beginning to make a comeback, however, because publishers are learning how to satisfy the more sophisticated and mature computer market. Today's action contests emphasize properly timed movements and good strategy rather than blinding reflexes, making them more suitable for adult computerists.

Beach-Head II (Access). This multi-scenario battle game continues the war which began with 1984's *Beach-Head.* The Carver brothers have expanded on their original concept to produce a game which can be played head-to-head as well as solitaire. The first scenario, in which a paratroop force attempts to knock out a machine gun nest, features the most chillingly realistic speech synthesis found on any microcomputer game. A leavening of humor keeps the horrors of war from becoming too overwhelming.

Dam Busters (Accolade). This solitaire action-strategy epic recreates the daring World War II air raid on key German hydro-electric installations which was celebrated in the mid-1950s movie, "The Dam Busters." The gamer pilots a Lancaster bomber on this perilous mission through the unfriendly skies in this pulse-pounding air combat program. Sydney Software, best-known for its designs based on "B.C.," turns realistic in this detailed real-time simulation.

Karateka (Broderbund). Author Justin Mechner brings the breakneck excitement of a martial arts movie to the computer screen. The player as-

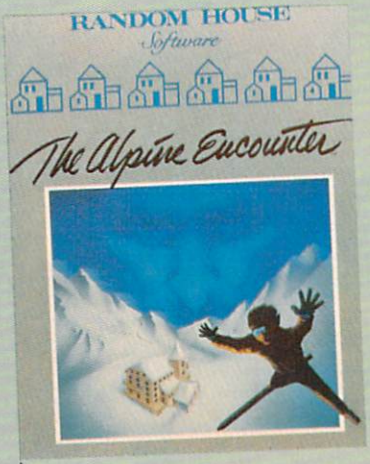


Reader Service No. 186

sumes the role of a fighting hero who is the only one capable of liberating the beautiful Princess Mariko from a stoutly defended citadel. An ingenious joystick-activated command system lets the computerist's onscreen surrogate deliver an assortment of deadly punches and kicks to the tenacious defenders, each of whom employs a distinctive combat style.

F-15 Strike Eagle (MicroProse). The documentation for some flight simulators is the size of the New York City telephone book, but *F-15 Strike Eagle* snips away needless complexity to heighten playability. The gamer can pilot an ultra-sophisticated jet airplane with a minimum of advance study. Despite the ease of play, designer Sid Meier has created a challenging simulation with scenarios based on a range of actual and hypothetical modern airwar situations.

When you go software shopping, these titles are worth a good look. Any of them makes a fine gift or addition to your own collection. □



Alpine Encounter: *snowballing action.*
READER SERVICE NO. 164

THE ALPINE ENCOUNTER

Random House Software
Commodore 64
Disk; $29.95

The Alpine Encounter is an illustrated adventure with a novel twist: this secret agent thriller includes an arcade-type skiing sequence. The player becomes Agent 456, who, as the game begins, has just arrived at the Alpenhof Hotel in Switzerland.

Agent 456's superiors have traced two seemingly unrelated crimes to VODAC, the sinister secret organization responsible for everything from the breakup of detente to the common cold.

The Alpine Encounter is an acceptable, if somewhat dated, game. Unfortunately, it banged around for a couple of years before finding a home at Random House, and state-of-the-art has advanced appreciably during this interval.

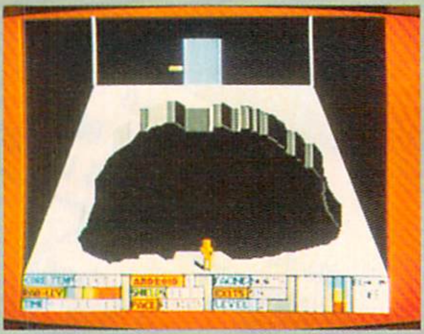
The plot moves along at a nice pace, it is satisfyingly convoluted, and the Alpenhof Resort is an intriguingly offbeat setting.

Once you locate skis, boots, and poles, the gamer may want to take a few practice runs down the mountain. The skiing sequence is a key plot element, not just a cheap frill. The player uses the joystick or keyboard to move left or right while zipping downhill. Although the graphics are hardly breathtaking, the real-time action is a stimulating diversion in what is otherwise a conventional design.

The parser is the essence of any adventure which requires the user to enter orders through the keyboard. The one used here is much too restrictive. The vocabulary is small with few synonyms. For example, when the player walks out onto the deck overlooking the slopes, he is told that the stairs lead to the cellar. However, the command "go cellar" elicits the response, "I don't know the word 'cellar'."

The storyline is too linear. The game often ignores player actions, because the writer has not anticipated the normal gamut of possibilities. Anything that isn't smack in the middle of the plot won't work. Try wandering around the hotel and asking Alpenhof employees where to rent skis. You'll slide down the hill barefoot if you wait for these stiffs to help you!

The quality of the illustrations is uneven. Inanimate objects, such as buildings, lobbies, and the tram, are just fine, but people resemble stick figures. The color scheme is one of the worst in recent memory. The white screen border and the excessive use of pastels makes everything look insubstantial: there are almost no dark colors, but there's no shortage of orange-on-grey and similarly revolting color combinations.



Countdown to Shutdown: *beat the clock.*
READER SERVICE NO. 165

Though *The Alpine Encounter* shows a flash of wit by naming the chalet midway down the slope the "Halfway Haus," even lines by Woody Allen wouldn't remedy its other shortcomings. Play it for the engaging plot and novel real-time action, but don't expect virtuoso programming.

Random House Software, 201 E. 50th Street, New York, NY 10022 (phone: 212-751-2600). *—Bill Kunkel*

COUNTDOWN TO SHUTDOWN

Activision
Commodore 64
Disk; $29.95

Condition Red! Condition Red! A reactor buried deep beneath an underground complex is heating up fast. If a few carefully installed damper fields don't cool it soon, it's going to melt down! Of course, no human could survive the intense heat, radiation, and hostile attacks from haywire guardians for long—that's why the company built eight specialized, super-intelligent droids for the mission.

For all its action-game trappings, *Countdown to Shutdown* is a strategic race against time to penetrate eight levels of a technological labyrinth, locate the reactor control room, and then place enough damper fields on the inflamed machine to cool it down to a mere 1000 degrees or so. Succeed, and the world owes you a huge debt of gratitude. Fail, and the world might not exist much longer.

At the start of the game, the player gets a choice of eight different droids to control. Each is a little different: some are more powerful, some are smarter, and some have a higher level of technical know-how,



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a convenient collection of skills that makes it possible to fix broken door controls. The first order of strategy is to choose the one that has the best chance of surviving the various perils of the labyrinth.

As soon as the robot leaves the first elevator shaft, the core temperature starts rising one degree at a time. When the number indicator rolls over, meltdown begins and the game ends. The first order of business is to find a way down to the eighth level where the reactor control room is located.

Along the way, the droid may find useful objects like trans-mats, which teleport the user down a few levels, or techni-kits, which increase the droid's technical expertise. A few odd items, like fluted wine glasses and cigarette butts, serve no purpose. A single droid can't carry more than eight objects at a time, so choose possessions carefully.

Various enemies, like guardian droids and plasma, dog the robot's footsteps as it moves from room to room. They seem to be more of a nuisance than a real threat, since they can be destroyed by multiple blasts from the player's laser pistol.

The joystick guides robots through the maze. To open a closed door, the robot touches its control panel. Gray panels indicate broken or damaged locks which can be fixed by a technically adept droid. Other useful functions reverse the perspective of the room, making the bottom of the chamber appear at the top of the screen, transfer all inventory items from one Ranger droid to another, or use an item. There's also Help available for the baffled player.

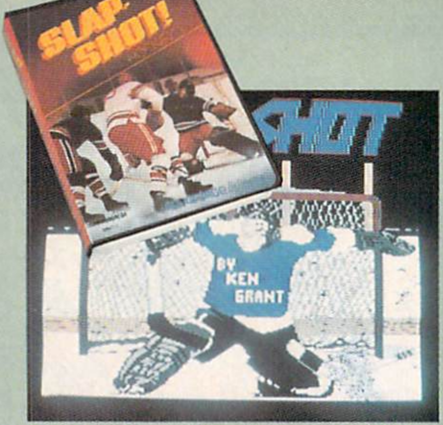
Elevators and trans-mats are the surest, safest routes to the eighth level. Of course, finding them is the tricky part! Gaping holes in the floor provide a faster way down, but weaker droids are disabled by the damage sustained. If this happens, the player has no choice but to send another robot to the rescue.

Once the robot locates the reactor, it must insert dampening fields into the overheating core. This immediately starts lowering the temperature in single-degree increments. The reprieve doesn't last long, though, and total cooldown will probably require more fields than one robot can carry.

Countdown to Shutdown graphics feature careful details right down to the shadow cast by the droid as it walks. However, sound effects aren't the game's strong suit. The real fun starts *after* you've discovered the control room, when the first crucial damper fields are in place and the task is to find even more—without losing the way back to the reactor. Suspenseful? Absolutely. But if you can't stand the heat, get out of the control room!

Activision, 2350 Bayshore Frontage Road, Mountain View, CA 94043 (phone: 415-960-0410). *—Kim Clarke*

SLAP-SHOT
Advantage-Artworx
Commodore 64
Disk; $19.95



Best hockey simulation available.
READER SERVICE NO. 176

Computer hockey simulations, whether action- or statistics-oriented, are as scarce as a checking forward's front teeth. U.S. Software producers are reluctant to devote time and resources to the development of a game based on a sport which is popular only in some regions of the country.

It seems only appropriate, therefore, that the first major league hockey game should hail from Canada. Ken Grant's *Slap-Shot* does not represent a high-water mark in the history of computer programming, but it easily surpasses any previous puck simulation. It's a three-screen, full-scrolling contest, complete with bodychecks and penalties, and should certainly appeal to devotees of mayhem on ice.

Slap-Shot is the product of a hockey fan's consciousness. The game opens with a "dedication" to Team Canada and a list of available Olympic squads. Unfortunately, this encourages the player to expect much more than the program actually delivers. The team selection affects only the color of the uniform, not the squad's style or quality of play.

The coaches use the Commodore's function keys to choose from among three speeds of play. Each player uses the joystick to control one active skater while the machine directs the movements of the rest of the team members.

The man currently under joystick control turns a slightly darker color than the rest of his teammates. Pointing the joystick and hitting the action button shoots the puck or passes it to another player. Similar control schemes maneuver the goalie and throw bodychecks. The ice scrolls horizontally in response to the movement of the onscreen athletes, and the entire rink occupies three full screens.

This game's greatest weakness is its two-player-only format. The computer can't coach a team against a human opponent. Advantage-Artworx plans to remedy this by producing a new version with solitaire option.



Crusade in Europe: *won't fatigue.*
READER SERVICE NO. 177

Let's hope the design also addresses some of the program's other shortcomings. Computer control is one area which could use some fixing. The skaters not directly controlled by a human might as well be on the bench. They cruise around in aimless, phlegmatic patterns, sometimes moving right next to the puck without attempting to claim possession of it. It's awfully difficult to pass the

puck when the other player doesn't want it.

Making the selection of the team mean something would also improve *Slap -Shot.* It would be very nice if the computer-directed skaters of "Team Canada" played very physically, while the Swedish squad favored a wide open game.

Slap-Shot claims to include penalties, but it doesn't handle them realistically. Whenever an infraction is called, the game brings the puck back to the offending team's end of the ice for a face-off. Since the primary consequence of a penalty in hockey is that one team must skate for at least two minutes without one of its skaters, the simulation of this aspect is rather ineffectual.

The graphics are acceptable. The playing surface is large enough to keep the skaters from blending together and becoming hard to follow. Designer Grant wisely chose to depict the rink in three-quarter perspective with the players shown from the side. The puck is large and easily visible against the white background. Audio consists of the usual cheering and a few fillips of voice simulation by Electronic Speech Systems, which also produced the voice in *Ghostbusters* and *Impossible Mission.*

Slap-Shot, though far from perfect, is nonetheless the best computer hockey simulation available today. Let's just hope that it doesn't stay that way too long.

Advantage Computer Accessories, Inc., 1020 Meyerside Drive, Unit 8, Mississauga, Ontario L5T 1K7 Canada.

Artworx Software Company, Inc., 150 North Main Street, Fairport, NY 14450 (phone: 800-828-6573).

—Bill Kunkel

CRUSADE IN EUROPE

MicroProse Simulation Software
Commodore 64
Disk; $39.95

No type of game has benefitted more from the application of computer technology than the military simulation. The non-electronic variety generally takes ages to set up, requires players to do a lot of record-keeping, and comes with roughly three pounds of documentation. In short, the typical war boardgame is a major undertaking.

Crusade in Europe is an excellent example of how the computer makes wargames easier to learn and more fun to play. Authors Ed Bever and Sid Meier have produced a game laden with features which bring out the nuances of World War II fighting in the European theater, but this is no ponderous "monster game" which requires a couple of hours to complete a single turn.

This operational-level simulation utilizes division-size units (8,000-20,000 men) to recreate battles from D-Day to mid-October, 1945, the point at which Nazi Germany was driven back inside its original borders on the Western Front. There are five basic scenarios. All but the campaign version, "Crusade: The Battle for Europe" have a selection of variants. The Normandy scenario, for instance, can cover just the beach landing or extend all the way to the liberation of Paris. The "Rommel's Strategy" and "Quick German Reaction" options allow players to see how hypothetical changes in Hitler's strategy for the defense of France might have affected the situation.

Unlike most military simulations, *Crusade in Europe* unfolds in accelerated real time. The player is not fettered by discrete turns, but may enter orders whenever appropriate. Each unit usually has a chance to move approximately every eight scale hours as indicated by the time/weather strip located immediately above the map. The game is intended for either solitaire or head-to-head play, but it works better when one human general fights against a computer-directed foe. Although the program provides a method for switching between two human competitors, it is clumsy and too likely to lead to jostling for the controls when the battle reaches a critical stage.

The cursor, manipulated with a joystick, is the primary means by which a player issues orders and obtains information about men under his or her command. After positioning the cursor over a friendly unit, pushing the button (or the space bar) establishes contact with division command. This elicits information about the number of men and tanks in the unit, the amount of supplies remaining, the formation, the experience level of the troops, the unit's current effectiveness rating, and the nature of the last command it received.

A second press of the button prepares a friendly unit for an action order: Move, Attack, Defend, Reserve. Once a player issues an action command to a unit, moving the cursor and hitting the button enters an objective command. This is the part of the order which tells the unit where to move, attack, or defend.

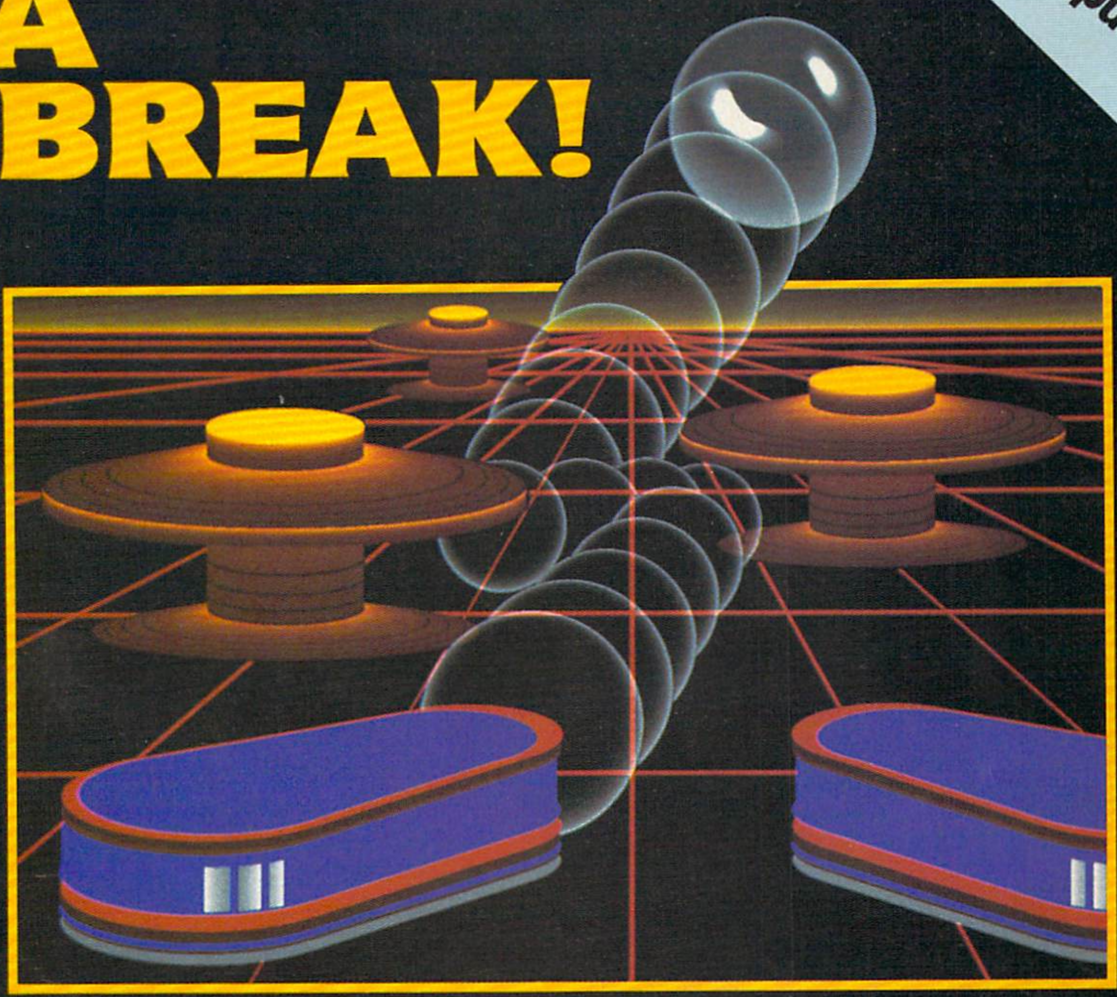
A third set of orders, the information commands, help the gamer keep on top of the developing situation and obtain data on which to base tactical decisions. Most of these use a combination of the stick and a keystroke. For instance, putting the cursor on a unit and pressing "G" produces a statement about the general who currently commands that division, while moving the cursor to a city or other critical location and pressing "C" generates a quick status report about the place. In addition, "O" calls up a strategic map, "B" allows the general to review the battle in progress, "T" temporarily removes all units so generals can study the terrain, "?" tells who's winning the battle, and "W" moves the cursos over the friendly unit which has sent the most recent message to your headquarters. This last order is handy for coming to the aid of a unit in trouble before disaster overtakes it.

Many computerists will no doubt feel that the most important command is "f7", which pauses the game. Since order entry is continuous, a minute here and there to plot strategy is an absolute necessity. A game-in-progress can be saved on a formatted disk and restored at a later point.

Supply plays a larger role in *Crusade in Europe* than in most other computerized wargames. Every night, units which have a path to a headquarters unit or depot are resupplied at night. These valuable units can't put up much of a fight if attacked,

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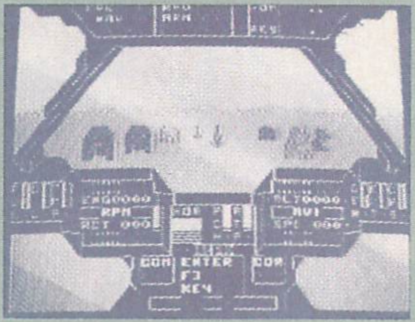
so the commander must always make sure to protect them against the ever-present danger of lightning raids by the enemy.

The documentation straddles the line between providing the essential facts needed to boot and battle, and giving the player enjoyment-enhancing background. The first three sections explain the rules, the fourth provides extensive historical notes and a reading list, and the fifth presents full data, including the order of battle and victory conditions, for each of the scenarios.

Crusade in Europe hits a new high in playability for computer wargames without sacrificing mental challenge or tactical scope. Those who have always felt overwhelmed by complex military simulations are entirely likely to find this one a great deal less threatening and, therefore, a great deal more entertaining.

MicroProse Simulation Software, 120 Lakefront Dr., Hunt Valley, MD 21030 (phone: 301-667-1151).

–Arnie Katz



Flying **Super Huey** *is no milk run.*
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SUPER HUEY

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Electronic gamers just l-o-v-e helicopters. Always have. From the earliest days of videogaming, the helicopter has been the preferred mode of travel. Classic programs utilizing whirlybirds include *Super Cobra, Choplifter!* and *Raid on Bungeling Bay.* It was obviously just a matter of time until the current vogue for flight simulators caught up with this primal affection.

Paul Norman's ambitious *Super Huey* takes on the challenge in a self-confident, straightforward manner. The video pilot flies a UH-IX, an ultramodern, high speed chopper intended primarily for surveillance and reconnaissance, but able to defend itself with rockets and machine guns.

Super Huey opens with a truly ostentatious introductory sequence, complete with pseudo-majestic theme music and elaborate credits. (Designer Norman's name is emblazoned on a helicopter which flies across the screen.) It's quite amusing the first few times, but the gamer will soon wish for a way to short-circuit all the hoopla.

Super Huey provides a marvelous view of the action, with a front window, two side portals, and floor vents. Unfortunately, it isn't always worth the effort to look down through the vents, because the terrain is a relentless green speckled with icons which represent houses, radar, and other points of interest. The blocky, largely uncolored symbols and graphics are a real wet blanket. Helicopters, unlike jet fighters, fly close to the ground, so the landscape should be quite detailed to look realistic.

Flying the UH-IX presents further difficulties. The documentation breaks flight into two main elements; the control stick and the computer keyboard. *Super Huey* is a good choice for cooperative play by two gamers. One can control the joystick while the other monitors the onscreen gauges and presses the appropriate keys. Doing both at once calls for quite a bit of practice and coordination.

The documentation gets to the crux of the matter when it states: "Airplanes are inherently stable whereas helicopters are inherently unstable." In other words, once an airplane gets into the air, the pilot can take a deep breath. A helicopter, on the other hand, requires constant attention. In striving for verisimilitude, *Super Huey* overdoes the number of control functions. Flying a helicopter is not easy, and neither is *Super Huey.*

The documentation helps. It is cogently written, but errs in combining factual instruction with aerodynamic theory. Step by step directions for booting the disk and getting airborne appear cheek-by-jowl with a dissertation on conventional helicopter control. Nonetheless, it has all the information, and there's even a handy four-page card with specific flight instructions.

Players can opt for any of four types of missions. "Flight Instruction" is an excellent prompt-oriented tutorial; "Exploration" is an aerial survey; "Rescue" sends the copter into mountainous terrain to save injured soldiers; and "Combat" is set in a secret desert installation under enemy attack.

Actually, the UH-IX is not a combat aircraft, despite its armament, so the "Combat" scenario is less of a blastathon than gamers might expect. The object is reconnaissance and, only when absolutely necessary, defense.

Super Huey tries very hard and succeeds at much of what it attempts. Purists will wish for more detailed terrain, and a less complex control scheme would have been a blessing, but most chopper fans will gladly take this exciting flight simulator just as it is.

Cosmi, 415 N. Figueroa, Wilmington, CA 90744 (phone: 213-835-9687).

–Bill Kunkel

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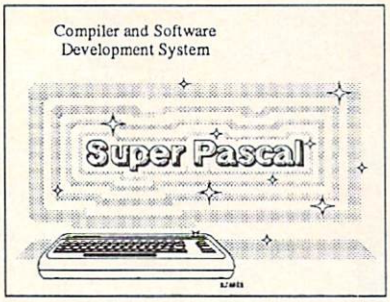


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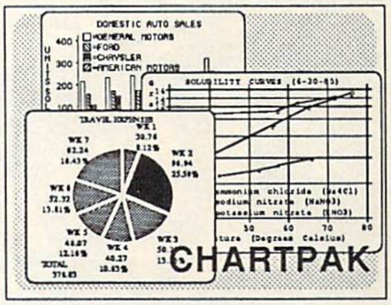
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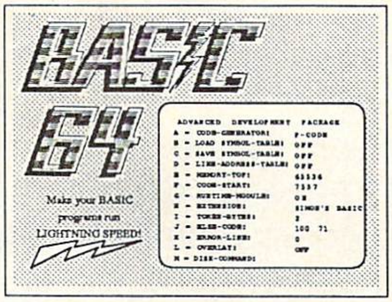
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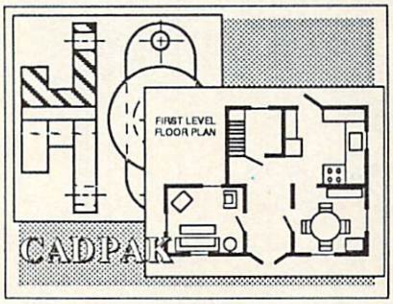
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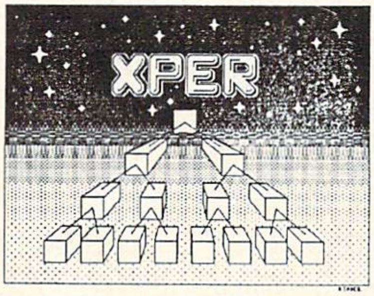


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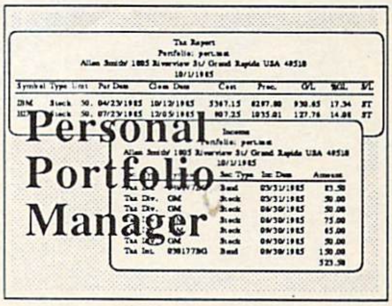
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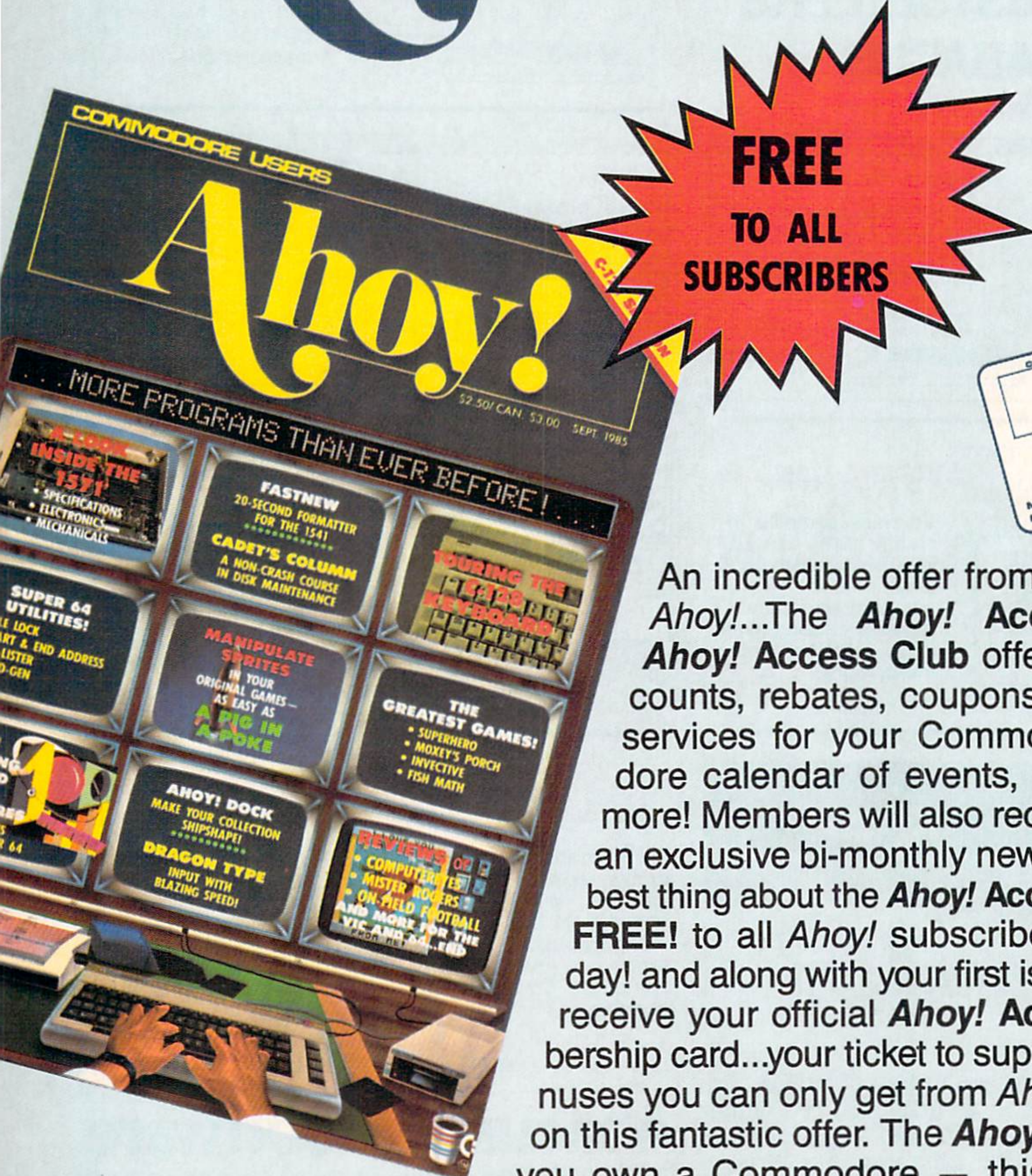
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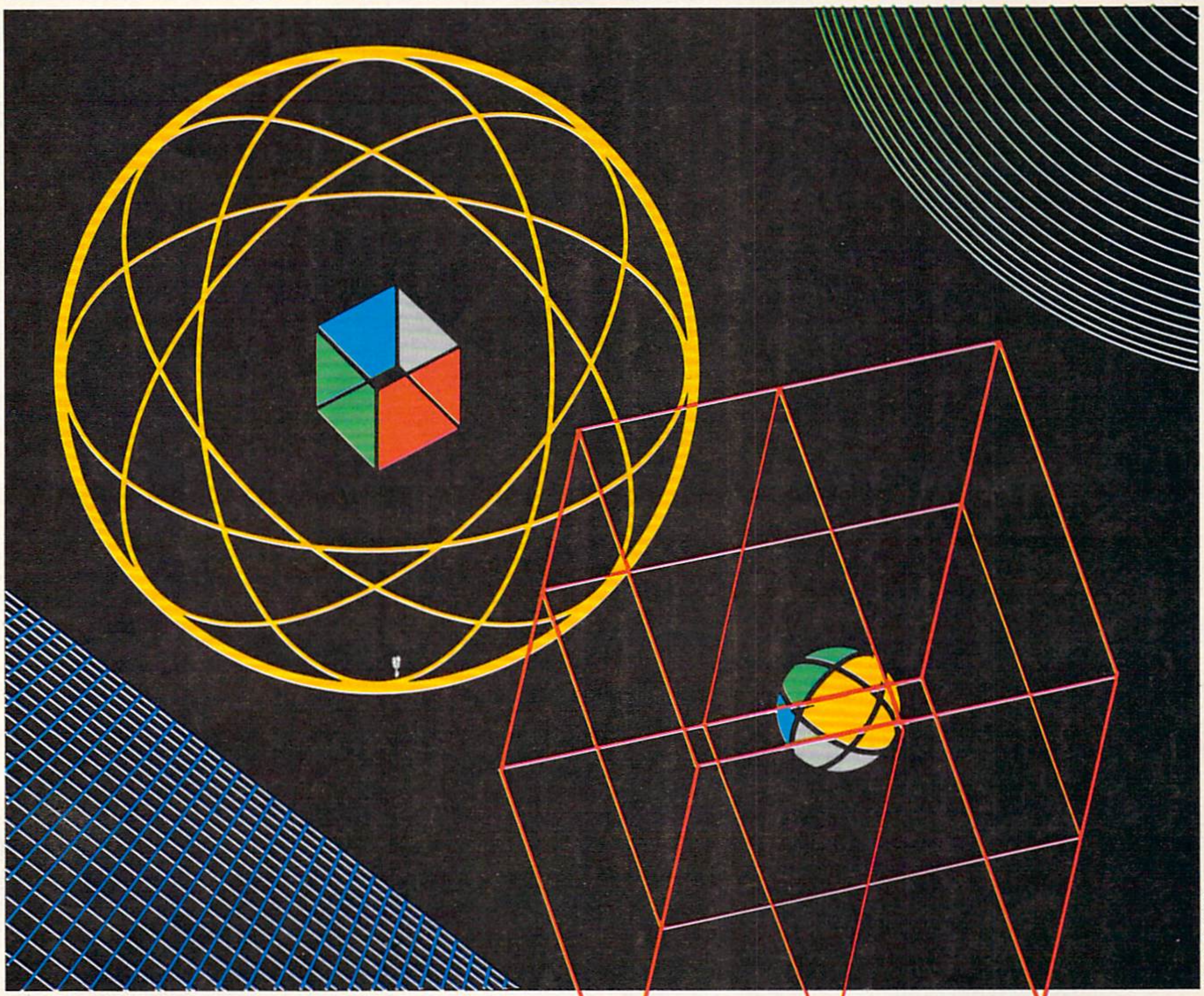




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RUPERT REPORT



THE IBM CONNECTION

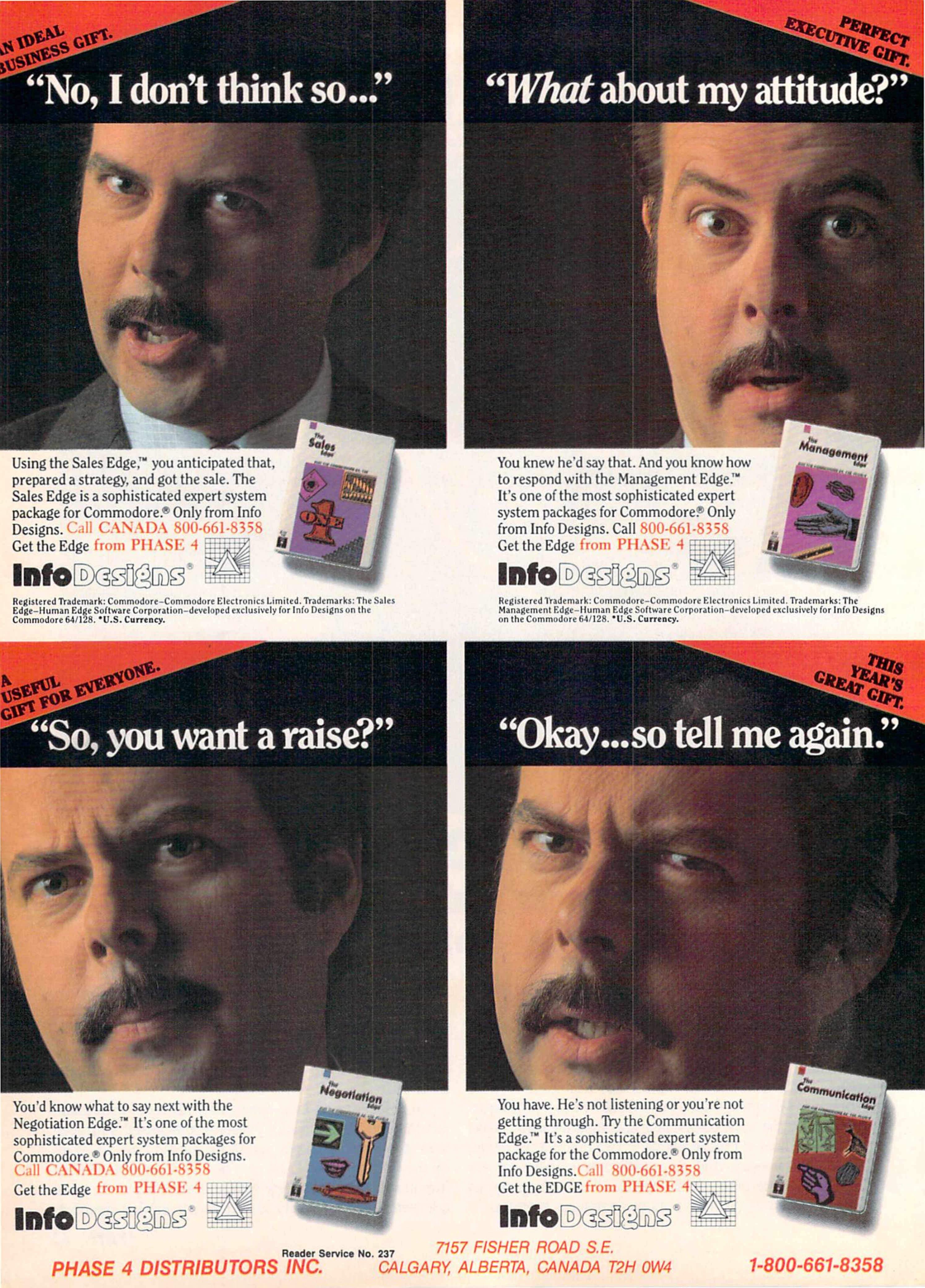
One Electronic Brain Meets Another

By Dale Rupert

It's easy to link two computers and let them talk to each other. One computer might challenge the other to a quick game of checkers or chess. Through the concept of parallel processing, a lengthy task could be shared between two computers and finished in half the normal time. Fault-tolerant computer systems typically have three or more processors performing the same computations, comparing their results with the others' at crucial points. If two out of three agree, their result is used. If all three differ, the calculations are repeated or the problem is flagged. There are numerous other reasons to tie two or more computers together.

This month we will see what it takes to tie a Commodore 64 or a VIC 20 together or to almost any other computer. Specifically, we will discuss the hardware and the software needed for a Commodore computer to communicate with the IBM Personal Computer over a simple, three-wire RS-232 serial link.

We will deal with bare-bones, no-frills serial communication. The most difficult aspect of this month's project is to round up the proper connector for the User I/O port on the Commodore (C-64 or VIC 20) computer. Within minutes of getting the few required parts together, your computer can be happily chatting with another member



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of its family tree.

FIRST, THE HARD PART

Only minimal hardware is required to link two Commodore computers together. You need two twenty-four (24) pin card-edge connectors and three wires between them. The card-edge connector pins must be on 0.156 inch centers. The twelve pins on the upper half are numbered 1 through 12, and on the lower half they are labeled A through N (skipping G and I). The *User's Guide* and the *Programmer's Reference Guide* show the pin configuration of the card-edge at the rear of the computer. Look at your User I/O slot, then go to an electronics parts store for the proper connector. Besides the connectors, you need only wire and solder.

Figure 1 on page 114 shows the three-wire link to join two Commodore computers together. Table 6-1 in the C-64 *Programmer's Reference Guide* provides the signal names for the pins on the connectors.

To connect a Commodore computer to an IBM-PC or any other computer using RS-232 levels, you need two integrated circuits as well as a different connector for the IBM side of the cable. The IBM serial port uses a standard DB-25 female 25-pin submini D-type connector (Radio Shack #276-1548 for example). You also need a 1488 RS-232 line driver and a 1489 line receiver (Radio Shack #276-2520 and #276-2521 will work) as well as a 9 volt power source.

The Commodore User I/O signals are at TTL (transistor-transistor logic) voltage levels. A binary one output is any voltage from 2.4 volts up to the 5 volt supply, and a binary zero output is typically from 0.4 volt down to zero volts. RS-232 voltage levels are quite different. A logic one is a voltage below −3 volts and a logic zero is a voltage greater than +3 volts. The RS-232 logic levels are not only inverted but also shifted with respect to the TTL levels.

The 1488 line driver chip converts TTL signals into RS-232 signals. The 1489 line receiver chip converts RS-232 signals back into TTL levels. The 1488 needs two power supplies. The Commodore user port provides +5 volts which is used for the positive supply. A 9 volt battery may be used for the negative supply, although a 9 volt DC battery eliminator or power supply would be preferable for serious use of the interface. The 1488 draws as much as 17 milliamps from the −9 volt source, so a bargain battery won't have a very long life. It is also possible to build a negative DC supply from the 9 VAC outputs on pins 10 and 11 of the User I/O port. Figure 2 on page 114 shows the schematic for a Commodore to RS-232 interface.

I built the circuit on a solderless breadboard near the Commodore and ran a three-foot long three-conductor wire to the IBM. You may do the same, or for a more permanent circuit, you should solder the chips and wires to a predrilled PC board mounted near the Commodore's connector. The layout is not critical for transmissions up to 1200 baud over relatively short cables, and that is fast enough for use with BASIC.

If the hardware side of this project scares you away, consider having a friend at your user group help. If you've always wanted to try your hand at electronics, this is a perfect beginning project. Now over to the software side.

NEXT, THE SOFT PART

If you thought the hardware was easy, wait till you see the software! We will develop three levels of software for linking two computers together. We will begin with simple transmit-only and receive-only programs for the Commodore and the IBM computers. Next we will implement a bidirectional, software-handshaking pair of programs which let the computers communicate without human intervention. Finally we will present a computer v. computer Hi-Lo game in which one computer picks a number, and the other computer attempts to guess the number with clues of "too high" or "too low." The Hi-Lo program *almost* runs without human intervention (a human must type RUN on both machines!).

The programs COMMTX and COMMRX on pages 126 and 127 are transmitter and receiver programs for the Commodore computers. If you are tying two Commodore computers together, load COMMTX into one and COMMRX into the other. Type RUN on the receiver and then type RUN on the transmitter. An important note before you begin:

Do NOT use the Wedge program while running these

Continued on page 114

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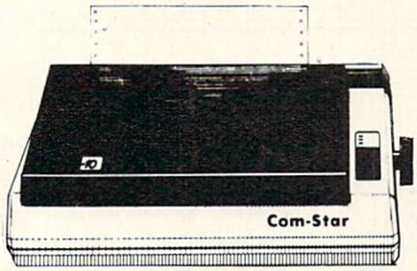
SALE **$179.00** SALE

1 Year Warranty
120-140 CPS
Premium Quality

List $599.00 **15½" Printer**

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10" Comstar 10X — This Bi-directional Tractor/Friction Printer prints standard sheet 8½"x11" paper and continuous forms or labels. High resolution bit image graphics, underlining, horizontal tab setting, true lower descenders, with super scripts and subscripts, prints standard pica, compressed, expanded, block graphics, etc. Fantastic value. (Centronics parallel interface.)
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15½" Comstar 15X — Has all the features of the 10" Comstar 10X plus a wider 15½" carriage and more powerful electronics to handle large ledger business forms! (Better than FX-100). The 15½" Comstar 15X also prints on standard size paper and continuous forms and labels. Fantastic value. (Centronics parallel interface.)
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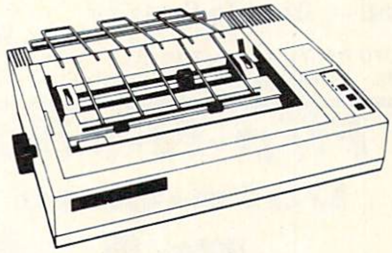
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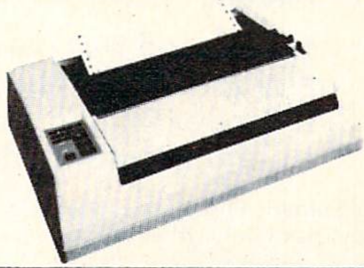
SALE **$259.00** SALE

Lifetime warranty*
165-185 CPS
High Speed & Letter Quality

List $599.00 **10" Printer**

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Commodore-64, VIC 20 — $39.00 Atari — $59.00 Apple II, II+, IIe — $59.00

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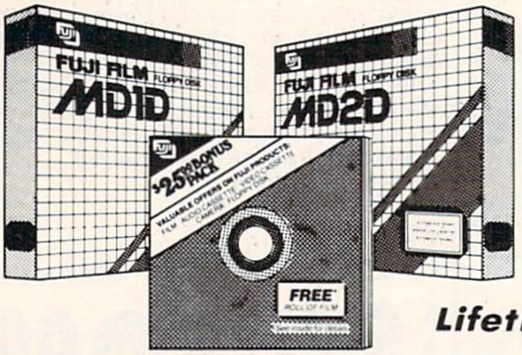
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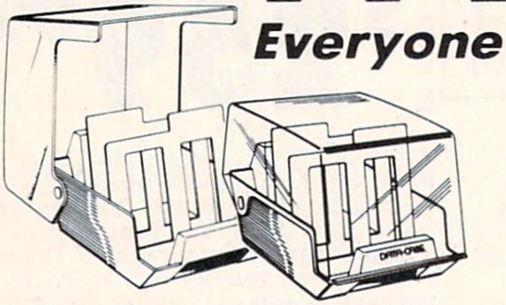
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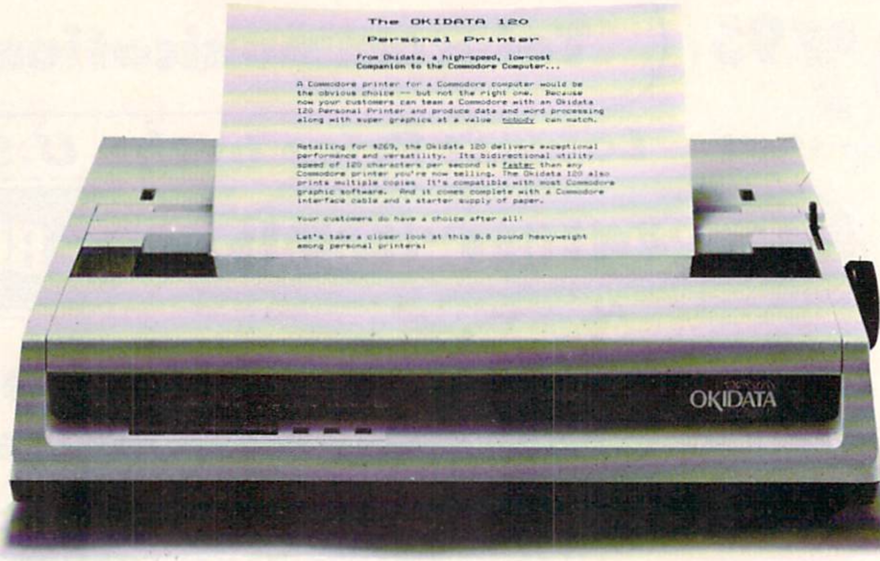
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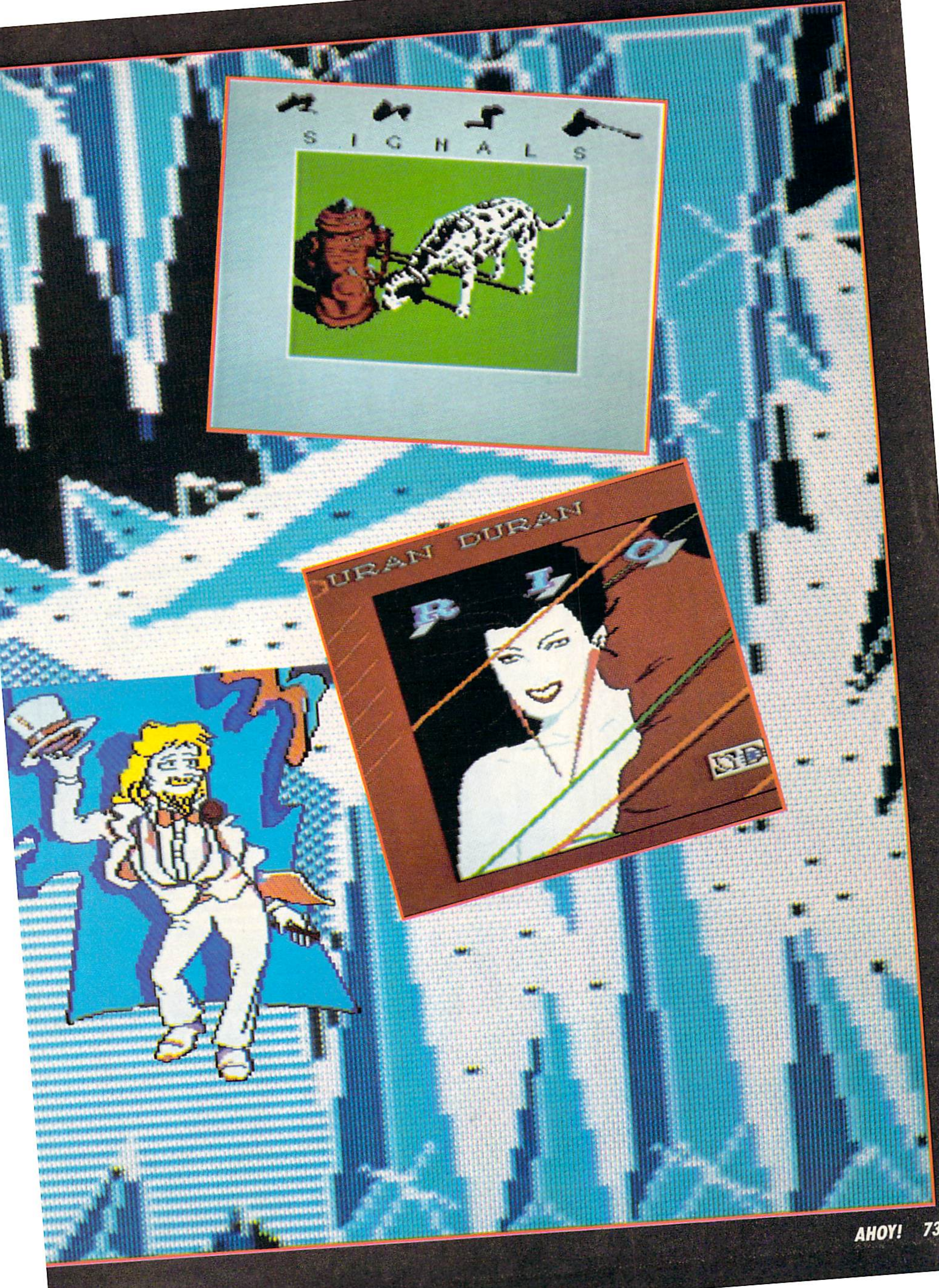
Contributors to *Ahoy!'s Art Gallery* will receive royalties based on the sale of disks. Send your best work on disk, accompanied by a stamped and self-addressed mailer, to Morton Kevelson, P.O. Box 260, Homestead Station, Brooklyn, NY 11229. Indicate the drawing package that was used to create the image. If you employed a bit map of your own design, indicate the appropriate file parameters, i.e., hi-res or multicolor, location of bit map, screen or color data.







Readers call us every now and then to complain about snow on their computer screens. We're sure they wouldn't complain if their snow was as attractive as that rendered by two of the contributors to this month's *Art Gallery. Winter* by Michael Montauck (Brooklyn, NY) was created on the Koala Pad with *Koala Painter* software. *Snowman* was submitted by Earl Hamner (Milpitas, CA). Forming the background of this month's *Art Gallery* (and shown unobscured at lower left) is *Ice Planet,* drawn on *Paint Magic* by Jeffrey Hart (Brooksville, FL). Segueing from ice to rock, the covers of the albums *Rio* and *Signals* were interpreted on the Koala Pad by Sean Huxter (Springdale, NF). Mr. Huxter is a commercial freelance artist and cartoonist who is seeking to get his original comic strip syndicated. We wish his strip as much success as the one from which he derived his third image featured here—*Zonker.*


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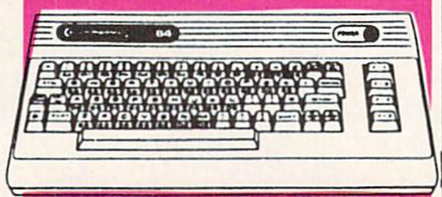
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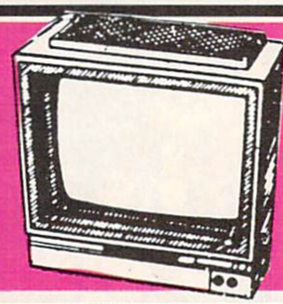
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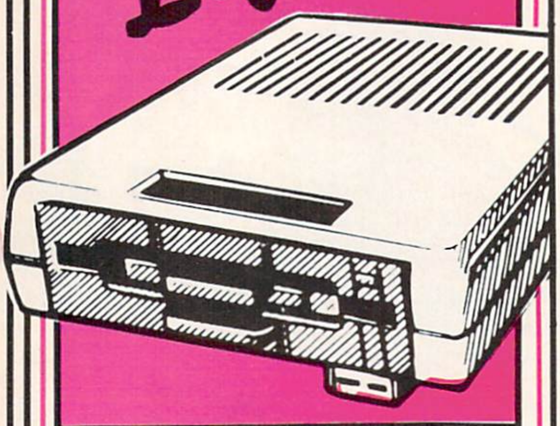
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Also included is the 2 Key Load. Pressing the Shift/Run Stop will load "*", 8, 1.

You can choose from any of these colors: Black, White, Red, Light Red, Cyan, Purple, Green, Light Green, Blue, Light Blue, Yellow, Orange, Brown, Dark Grey, Medium Grey, Light Grey.

P.S. . . . It sure is nice having your own colors and message on the screen on power up!

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- Specially designed for the C-64 and 1541 Disk Drive.
- Completely encrypts and protects your programs.
- Fully compatible with almost all machine language and basic programs — can even support chained programs.
- Contains a special feature which protects your program from being 'broken.'
- Incorporates all the latest techniques in program encryption and protection.
- Each system has been specially prepared and is unique from all other systems — only **you** are able to make working duplicates of your own protected programs.
- Simple and easy to use — entirely menu drive with prompts.
- Will stop virtually all software copiers from duplicating your programs.
- Fast and reliable protection routine does not take away any useable space from your disk — all 664 blocks are available for use.
- Easy to follow step by step instructions are included on the disk.
- A **must** for all programmers who do not want their programs to be in public domain!

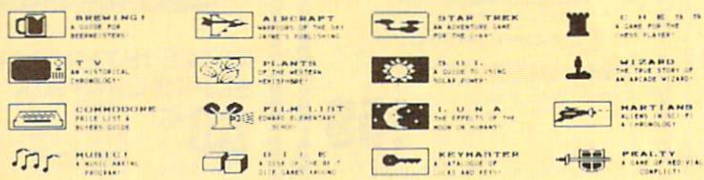
Even the "nibblers" can't copy them. Not even *Disk Maker, *Mister Nibbles, *Copy II, *Ultra Byte or *Fast Hackem. The time to protect you disk is only 5 (five) seconds and each Master Lock makes a different protection scheme. Only

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*Disk Maker™, Basix
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Give your labels the professional touch. With Hi Rez Graphics make your own design or use one our 60 premade labels with easy to use on screen editor. You can insert up to three lines of text then choose the picture you want to put on the left hand side of the label. Then you can print out as many labels as you want. This has got to be the neatest label program out there and it's only **$24.95**



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This disk has over 100 routines, some of them are routines for protection, smooth scrolling, modem routines, and sound and color routines: bootmaker, paddle and joystick: read terminal, auto dial, auto answer. They can easily be incorporated into all of your programs. It is also fully documented. With this disk alone you could build your own program. This disk has a lot of tricks that are used in commercial software.

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Now you can log all of your disks into a neat filing system. Automatically record disk names and program titles. Allows you to quickly scan what you've got. Sorts titles; prints jacket covers; store up to 1600 disk directories on one disk. Search quickly through your entire disk collection for a misplaced program. Works with one drive or two. Fast, easy operation. This program is a must for everyone!

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SWIFTERM:
is absolutely the easiest terminal program available anywhere.

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- New printer and midwestern protocal
- Printer dump
- DOS commands access from menu
- Phone book
- Auto dial (with auto redial)
- 29K storage buffer
- Save to disk
- Standard ASCII up/down loading
- 300/1200 Baud

This is an excellent easy to use program for a very reasonable price.

THE MODEM:
Auto dial, auto answer, 300 Baud modem that is 100% compatible with Commadors 1650 modem, so all our software will run with it.

ALL THIS FOR ONLY $35.96

So why buy just another terminal program when you can get a modem, too!?!

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Message . . . is a unique graphics integration package which allows you to continuously display hiresolution and multicolor files. Up to 12 files* may be stored in memory and displayed from 1 to 59 seconds each.

Message . . . can use Print Shop 'Screen Magic' files, Flexidraw files, Doodle!, Koala Painter, and more! **Message** . . . even comes with a 'Screen Maker' program to create your own message files!

Use **Message** . . . for advertising displays, titles for home videos, art shows, etc. . . . **Message** . . . even plays background music to accompany displays and you can create your own music files with the 'Music Maker' program.

Also included are 'Graphic Aids' utilities for conversion of different file types, including conversion of Koala Painter files to Doodle! or Print Shop!

The price for all this? Just $19.95 including shipping and handling

**Actual number of files dependent on file complexity.*

MAGNUM LOAD

Programed by Jim Drew

MAGNUM LOAD is a new replacement KERNAL (operating system) ROM chip for your Commodor 65 or 128 computer that will load and verify programs up to 6 times faster than before. The tape routines have been removed from the old chip and in their place have been put a high-speed loader, high-speed verify, and disk driver no-head-rattle routine. Unlike the older cartridge fast loaders, no ports are tied up at the rear of the computer, the screen is not blanked during loading and there is no wear-and-tear on the expansion port. For maximum convenience and performance, the chip is installed directly in the circuit board. Generally a socket has already been provided to make the operation easy, but occasionally some soldering may be required. Now you can give your 1541 disk drive "1571 speed."

Rather than give you more exagerated claims about how many times faster our ROM chip is compared to the slower cartridge versions, a comparison chart is supplied listing MEASURED loading times.

Program	Star-Dos	Reg. Load	Mach 5	Fast Load	MAGNUM LOAD
Pitstop II	?	144 sec.	43 sec.	41 sec.	**31 sec.**
Music Shop	?	105 sec.	105 sec.*	105*	**21 sec.**
Hitchhiker's Guide to the Galaxy	?	70 sec.	70 sec.*	N.G.**	**68 sec.**
On-field Football	?	149 sec.	66 sec.	63 sec.	**56 sec.**
EASY FINANCE I	?	58 sec.	13 sec.	13 sec.	**11 sec.**

$24.95 For 1541 or MSD Version

$39.95 for Combo Version

*Will not fast load - defaulted back to regular load

**Failed to load at all

D-CODER

- Translates any machine language program into easy-to-ready English descriptions with complete explanations of each command.
- Makes complete notations of all important memory locations accessed by the program (SID, VIC, MOS, KERNAL, etc.)
- Gives you three ways of accessing programs:
  1. **Will read and list programs from DISK**
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  3. **Direct user input (from magazines, etc.)**
- Can be used to locate and examine any machine language program's protection routines!
- Can be used to easily break apart machine language programs for study and examination!
- Printer option for complete hard copy listings!

You no longer need to be an EGGHEAD to read Machine Language.

$19.95

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THE PERFECT COMPANION PROGRAM TO D-CODER!

Allows you to easily make changes in machine language programs . . . right on the disk!

- Rewrite ability allows code to be altered and then rewritten directly to the disk!
- Features sector-by-sector scrolling assembly language display of machine language programs!
- Notation of ASCII text equivalents for easy spotting of embedded text strings!
- Handy reference display of all assembly language commands and their ML numerical equivalents!
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Third Edition! Now Available!

If you're **tired** of being harassed by **protected software** and too many **copy** programs, then this is the book for you! This 224 page manual covers the gamut from legalities to protection methods to step-by-step back up procedures. Now you can learn both how to **protect and unprotect** software! The techniques covered include copying cartridges to tape or disk, tape protection, and disk protection. Disk protection covers error numbers 20, 21, 22, 23, 27 and 29 **plus** single track formatting, header modification, header swapping, half track reading and writing, reading and modified bit densities, formatting illegal track/sectors, sync writing and **more!** The Third edition **explains**, tells how to **detect** and how to **write** them with included software.

C-64 Book Only .... $19.95 US

Book & Disk of all Programs .... $29.96 US

This manual does not condone piracy *Shipping: $2.00

'TRACK TRAP' The 1541 Disk Expander!
• Supplement to the Software Protection Handbook •

The most unusual and innovative protection analysis tool for the Commodore yet! — **Not For Beginners** — This system expands your 1541 drive giving capability otherwise only possible for **professional** disk duplication equipment. Now you can create or analyze exotic forms of disk protection. **'D.O.S. Kings' Take Note!'** — Entire tracks of data can be read and written without regard to 'standard' sync and format. You are not longer limited to sector by sector searches. Whole track readouts reveal hidden data even when all or most of the sectors have been erased. Uncovers and writes data under errors, pulse coded sync or data, hidden data and access codes, multiple track densities and more! This supplemental manual covers the complete implementation of the track trap system including necessary software and hardware documentation.

Track Trap disk expanded manual .... $9.95 US

Top Secret Stuff I and Top Secret Stuff II

Programed by Jim Drew

Are both collections of 20 programs per diskette (that works out to about $1.00 per program!) that help you explore and enhance your Commodore 64 and/or 128 and 1541 disk drive. Now you can unlock many secrets formerly known only to top machine language programmers by using these sophisticated "tools." If you have ever been curious about the inner workings of your computer system, now is your chance to dig in and find answers with the help of these programs. These collections of programs have gotten rave reviews from actual users, and we are sure that you, too, will be pleased.

The programs include on each diskette are listed below

TOP SECRET STUFF I

The Dock (view/repair disk contents)
Sync Checker (diskette)
Imbedded Track Number Creator
Disk Manipulation System
3 Minute Copy (backup program)
Diskette Matcher (compare sectors)
Unscratch A File (recover file)
View BAM (block allocation map)
1541 Read/Write Test
½ Track Reader
Header Reader (display disk header)
Sync Maker
Device Number Change (disk drive)
Electronic Arts Backup
Drive Mon (disk drive m/l monitor)
Diskette File Log (start-end address)
Write-Protect Sensor Test
Repair A Track (recover data)
Fast Format (10 seconds)
½ Track Formatter

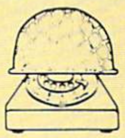
$19.95

TOP SECRET STUFF II

RAM Test (test Computer RAM)
Copy $AOOO-$FFFF (under ROMS)
Display G.C.R. (All sector data)
Un-Write Protect (diskette)
Unnew Program
Wedge - $8000
Smooth Scroll (messages up screen)
Koala Dump (koala pad screen dump)
Disk Manipulation System
Disk Eraser (20 second clean wipe)
Split Screen (TWO screen colors)
Disk Protection System (stops copies)
Write Protect (diskette)
Boot Maker (autobook BASIC programs)
Wedge - $COOO
Diskmatcher II (high speed version)
No Drive Rattle (on reading errors)
3 Times Disk Drive Head Speed
Monitor Test (check video monitor)

$19.95

WAR GAMES AUTODIALER

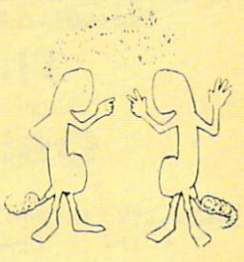


1. **Auto Dial** will automatically dial a set of numbers you choose.
2. **Review Numbers** will review numbers that were answered by a computer.
3. **Save Numbers** will save numbers where a computer answered.
4. **Hardcopy of Numbers** will print out list of numbers where a computer answered.
5. **LOAD Numbers** will load in numbers to continue where it left off.
6. **Continue** will pick up dialing where it was interrupted.

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BBS

- 300/1200 Band
- Remote access for sysop
- 2 levels of security for up and down load
- 7 rooms (read and write) with 4 security levels
- Secret highest level
- Open chalk board
- Auto message cycling
- Printer option



Plus the only BBS with all three (3) proticals X modem, new punter and midwest term, so anyone can up/down load.

Don't be fooled by cheap imitations. This is the most comprehensive system available anywhere. Now at a new low price.

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Programs for C-64 $2.00 S & H on all orders

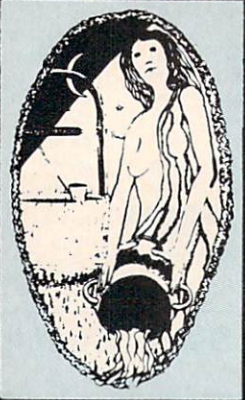
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Reader Service No. 205

FEATURED THIS MONTH: A brief survey of what's available for connecting low-cost IEEE-488 business peripherals to your Commodore 64 system, plus a close look at the SFD-1001 Disk Drive. **BY MORTON KEVELSON**

SFD-1001

Progressive Peripherals and Software
2186 South Holly, Suite 400
Denver, CO 80222
Phone: 303-759-5713
Price: $199.00

It was the worst of times, it was the best of times. It was the year when Commodore, the company which introduced many of us to the wonders of personal computing, showed its first signs of faltering in its ongoing efforts to sell more for less. It was also the year when more products with unprecedented capabilities, in the form of the Amiga and C-128, were introduced to the consumer at lower prices per feature than ever before.

Although it is too soon to tell just how successful these products will be (they do look like winners), we are seeing some side effects. Along with the preparation for the new, Commodore is performing a general housekeeping. As users we have the opportunity to purchase tried and true high-powered performers at a fraction of their original costs. Although these are presently overshadowed by their newest high tech brethren, their fundamental powers and capabilities are in no way diminished. The venerable C-64, the computer which has made the greatest impact in the personal market to date, is now available for less than $100—a mere pittance as compared to its original asking price of $595 just a few brief years ago.

Existing C-64 users are truly fortunate. A bevy of high-powered Commodore peripherals, originally intended for the business market, have been "surplussed" into the consumer market at bargain basement prices. Perhaps the most dramatic example is the SFD-1001, a single 5¼" floppy disk drive with an online storage capacity that exceeds one million bytes. That is the equivalent of more than six full 1541 formatted disks. This esteemed piece of hardware is being offered to us at a giveaway price of just $199 by Progressive Peripherals and Software. A true bargain, if you have an immediate or anticipated need for its capacity.

Figure 1

A—Power Transformer
B—Dual Read/Write Heads Below Shield
C—Head Positioning Stepper Motor

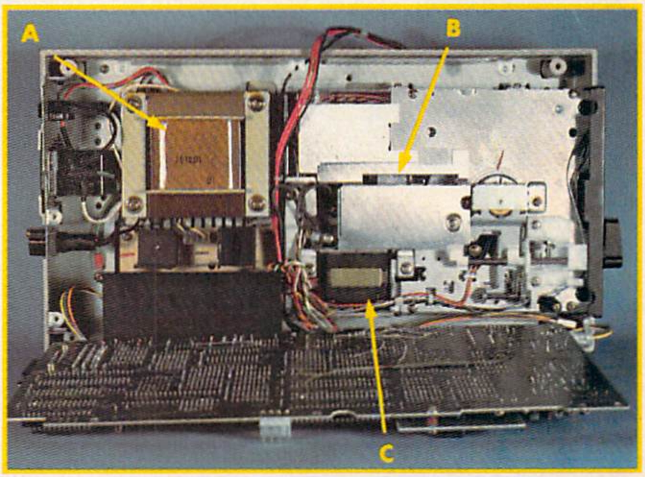
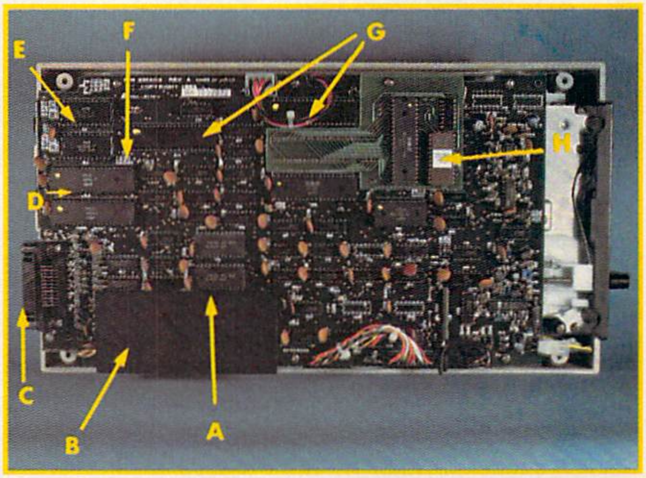


Figure 2

A—2K RAM
B—Voltage Regulator Heat Sink
C—IEEE-488 Connector
D—Pair of 6532 RIOT Chips
E—DOS on ROM
F—Device No. Pads
G—Twin 6502 Microprocessors speed up internal disk operations
H—2K EPROM



Drive chassis (top) and main circuit board of SFD-1001 drive.
READER SERVICE NO. 144

Under the circumstances, we felt the SFD-1001 merited a closer look. To start with, we call your attention to Table 1 where certain vital statistics are listed for easy comparison against the capabilities of the 1541 disk drive, that oft-maligned workhorse of the C-64 community.

A closer look at some of these parameters will be instructive. The SFD has more than four times the number of tracks used by the 1541. These data tracks, equally divided between both sides of the disk, contain more data than any single track of a 1541 disk. This means that double sided double density diskettes are required for the SFD-1001. These disks may cost significantly more than the single sided single density disks used by the 1541. Of course, each SFD disk will hold over six times the data of a 1541 disk.

Take note of the average file size

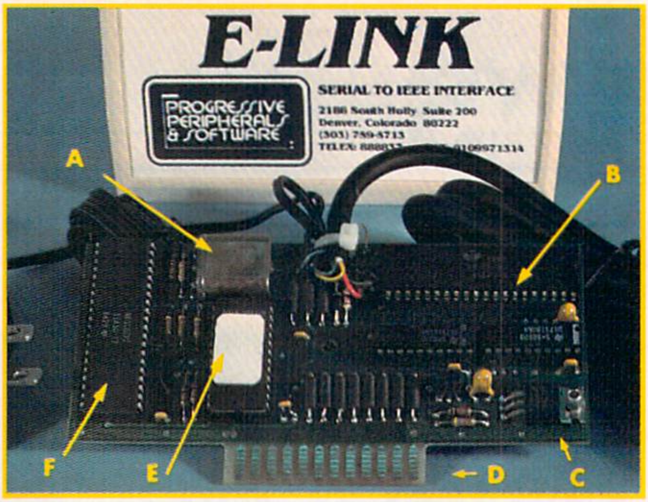


Figure 3

A—1MHz Clock Crystal

B—6522 VIA Chip

C—5-volt Voltage Regulator (the hot spot)

D—PET/IEEE Connector

E—4K EPROM

F—65C02 Microprocessor

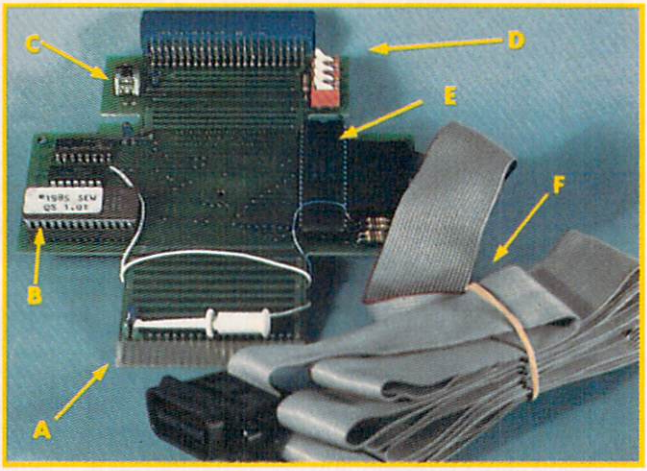


Figure 4

A—To C-64 Cartridge Port

B—8K EPROM

C—Reset Button

D—Set-up Switches

E—6520 PID

F—IEEE Cable

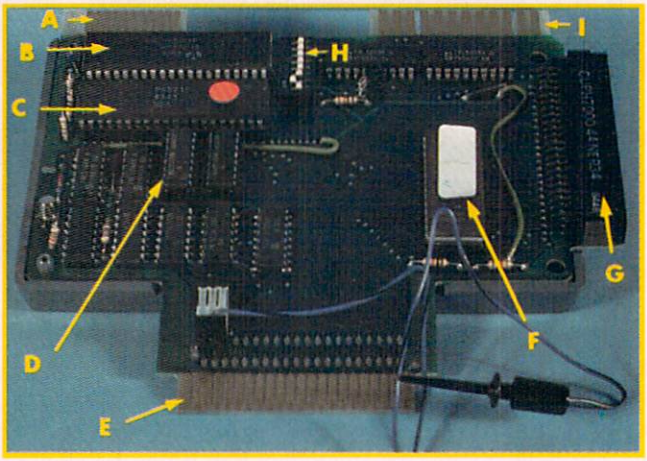


Figure 5

A—Parallel Printer Connector

B—6532 RIOT Chip

C—6821 PIA

D—256 Bytes PROM

E—To C-64 Cartridge Port

F—8K EPROM

G—C-64 Cartridge Port Extension

H—Set-up Switches

I—PET/IEEE Connector

Top: E-Link (Reader Service No. 145)
Middle: Quicksilver (Reader Service No. 146)
Bottom: BusCard II (Reader Service No. 147)

parameter in Table 1. This was obtained by simply dividing the total capacity of the disk by the number of available directory entries. The significance of this parameter lies with your own data habits. As you can see, the average file size on the SFD is 18.5 sectors, more than four kilobytes. Compare this to the 1541 which is only 4.6 sectors, or one kilobyte. This means that the SFD-1001 is more likely than the 1541 to run out of disk space due to a full directory if your application creates large numbers of small files. This could result in a full disk even if there are a significant number of blocks still free. The small average file size of the 1541 makes many users forget about this directory limitation, since it rarely happens.

Interestingly enough, the SFD uses the GCR recording format, which is unique to Commodore disk drives. You will also note that Commodore's practice of putting more data on the outer tracks than on the inner tracks has been retained. Table 2 compares the sector distributions of the 1541 and the SFD.

THE HARDWARE

The physical size of the SFD-1001 is identical to the 1541. Were it not for the labels it would be difficult to tell the two drives apart. Getting past the surface, things start to look a bit different. The most important concern to prospective users is the IEEE-488 interface over which the disk drive communicates with the computer. This parallel interface, which transfers data a byte at a time, is used on Commodore's PET and business series of computers. Although conceptually related to the disk drive serial bus on the C-64, this connection differs in both hardware and software from the disk drive serial port found on VIC 20, C-64, Plus/4, C-16, and C-128 computers. Thus an additional hardware interface will be required for most users. A detailed look at three of these peripherals follows immediately after this report.

Disks are locked into place by a twist lever. Do not attempt to close the disk door without first inserting a disk. The latching mechanism is mechanically interlocked to sense the presence of a disk. You cannot close the door unless a disk is in the slot. This is to prevent the hard, glass-smooth surface of the twin heads from coming into contact without the mitigating presence of the three-mil-thick disk mylar. Inadvertent contact of these polished surfaces could mar their finish beyond repair.

Internally, quality is visible throughout. Head position is checked by an optical sensor. The elimination of the head rap, familiar to all 1541 users, should go a long way towards

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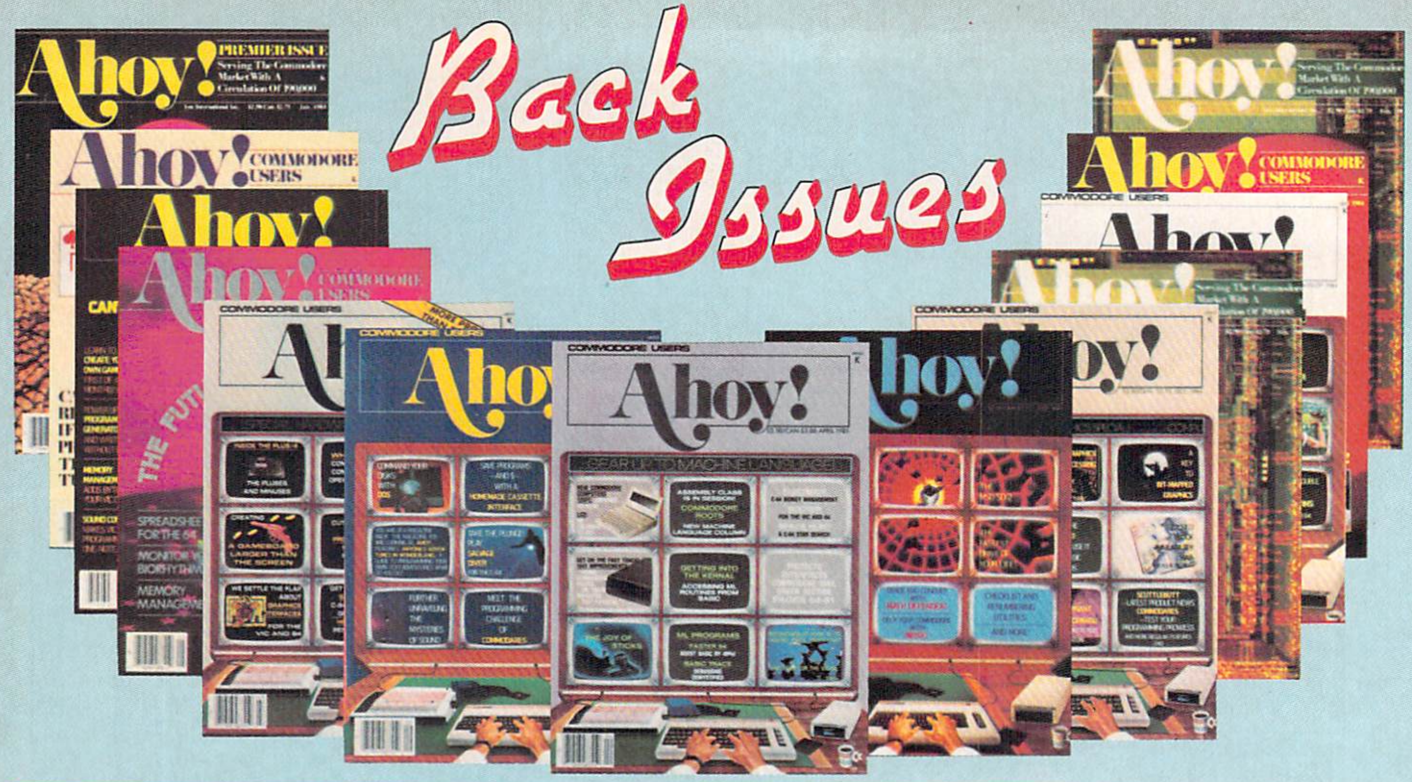
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TABLE 1—DISK DRIVE CAPACITY

	1541	SFD-1001
Storage (bytes)	174,848(SS)	1,066,496(DS)
Max. Seq. File	168,656	1.05 MB
Max. Rel. File	167,132	1.04 MB
Directory Entries	144	224
Number of Tracks	35	154
Sectors/Track	17 to 21	23 to 29
Bytes/Sector	256	256
Sectors per Disk	683 664 free	4166 4133 free
BAM Sectors	1	4
Avg. File Size (sectors)	4.6	18.5
# Heads	1	2
Microprocessor(s)	6502	2 x 6502
RAM Buffer	2K	4K
Interface	VIC Serial	IEEE-488

TABLE 2—DISK SECTOR LAYOUT

1541		SFD-1001	
Track #	# of Sectors	Track #	# of Sectors
1 to 17	21	1 to 39 78 to 116	29
18 to 24	19	40 to 53 117 to 130	27
25 to 30	18	54 to 64 131 to 141	25
31 to 35	17	65 to 77 142 to 154	23

preserving the alignment of the SFD-1001. This is as it should be, since alignment is far more critical than in the 1541 due to the double track density. Disk rotation is performed by a brushless and beltless TDK direct drive motor.

The electronics are equally impressive. Not one but two 6502 microprocessors handle the internal and external operations of the SFD-1001. These are supported by a pair of 6532 Ram-I/O-Timer (RIOT) chips and a 6522 Versatile Interface Adapter (VIA) chip. We found at least 18 kilobytes of onboard ROM as well as 4 kilobytes of working RAM.

User interface and drive status indication is via two indicating light emitting diodes (LEDs) on the front panel. The first of these is a dual purpose unit which glows green for power on indication and glows red for DOS error indication. The second is a red LED on the drive door to indicate drive activity.

The SFD-1001 was intended to be a "business" product. As such the Federal Communications Commission (FCC) requirements with regard to electromagnetic radiation are not as stringent as for consumer products such as the 1541. This is immediately apparent when the cover of the SFD-1001 is removed. The metal radiation shield, which is present in the 1541 disk drive, is not used in the SFD-1001. This does not affect the drive's performance as a computer peripheral. However, it may result in increased radio and television interference in the home. Prospective users of the SFD-1001 should be aware of this and be prepared to take corrective action. Generally all that will be required is a repositioning of the drive with respect to the affected components.

THE SOFTWARE

The SFD-1001 is equipped with version 2.7 of Commodore's DOS. It is fundamentally identical to the DOS used by the Commodore 8250 two

READER SERVICE INDEX

The publisher cannot assume responsibility for errors in the above listing.

megabyte dual disk drive. The DOS is fully compatible with all of Commodore's standard DOS commands as described in the 1541 disk drive manual, as well as numerous other sources.

Open File capacity is significantly enhanced. Table 3 lists the available options.

TABLE 3—SFD-1001 FILE COMBINATIONS

0 relative and 5 sequential
or 1 relative and 3 sequential
or 2 relative and 2 sequential
or 3 relative and 0 sequential

By comparison, the 1541 only supports two sequential files or one relative and one sequential file at a time.

If you buy the SFD-1001 from Progressive Peripherals and Software you will also get a utility disk with a number of programs that have been specially modified for the extra capacities of the drive. Included on the disk are a version of Disk Doctor, a track and sector editor released into the public domain by Solidus International. The disk also contains a number of backup utilities for transferring data between a 1541 and an SFD-1001 or for just backing up SFD disks. These include several file copiers and a BAM-driven copier.

THE GOOD AND THE BAD OF IT

The best part of the SFD-1001 is its enormous capacity. It is ideally suited for database applications where the one megabyte relative file size can handle very comfortable data collections. The large capacity is also attractive to bulletin board users. The only concern we have here is heat buildup for long term operation. We were unable to test this out before this review, but we should know shortly as we intend to place the SFD into service on the *Ahoy!* Bulletin Board.

The large capacity of the SFD-1001 is also its primary limitation. Remember, this is still a single drive connected to a 64 kilobyte computer (the C-64). Backing up an entire disk will take some time, about 90 minutes in our estimation. There are just no high speed copy utilities available for the SFD-1001. Even if a high speed copier were available, a full disk backup would be tedious. A minimum of 18 pairs of disk exchanges would be required to back up a single disk. Of course if you had two SFD-1001s, things would be a little better. A good copy utility could automatically transfer the files without your attention. Of course, this would still tie up the computer for well over an hour for each disk that you wish to copy.

We are assuming that C-64 users will be buying the SFD-1001 as a second disk, after a 1541. This makes sense unless you are willing to give up all access to C-64 commercial software which is available in 1541 format. Thus most users will be transferring their application software and data files to the SFD from a 1541. Both convenience and conservation of disk space make this a sensible idea. We found that Jim Butterfield's *COPY/ALL* did an excellent job of transferring files between a 1541 and the SFD-1001. Keep in mind as a rule copy protected software will not be transferrable to the SFD format, even if you use a copy program capable of making a backup on a 1541 disk drive. All application software will have to be put in unprotected program file format before it will be possible to transfer it.

CONCLUSIONS

The SFD-1001 is an excellent value as a high capacity online storage device—if your application and operating modes will support it. Prospective users should be aware of the long times involved in maintaining proper backups of their disk files when working when a one megabyte single disk on a 64 kilobyte system. We found the experience to be like a step back two years when the 1541 was first introduced. Even with the fastest IEEE interface, which we discuss below, the archival process will be tedious. If you are really serious about this type of data storage you may want to shop around for a Commodore 8250, a two-megabyte dual disk drive version of the SFD-1001.

IEEE-488 INTERFACES FOR THE C-64 AND OTHER COMMODORE COMPUTERS

The SFD-1001 reviewed above is just one of many IEEE peripherals, made by Commodore, which is becoming available at low cost at the present time. We expect IEEE peripherals to enjoy popularity for as long as inventories and the present pricing situation last. None of Commodore's current crop of computers will directly interface with an IEEE peripheral. An interface, much like a non-Commodore printer interface, is required. We report on three of these products. All were evaluated with the SFD-1001 disk drive and an MSD SD-2 dual disk drive. Table 4 (see page 86) lists all the interfaces and summarizes some of the results.

The CP/M boot times in Table 1 refer to the Commodore 64 CP/M 2.2 operating system and not the C-128 CP/M 3.0 version. It is without question the least expensive way to obtain hands-on experience with CP/M. The C-64 CP/M system enjoyed a brief popularity until Commodore changed the specifications of the VIC-II chip. The result was that most C-64s will not work with the CP/M cartridge which was designed for it. If you do have a working C-64 and CP/M cartridge combination, then you may benefit from an MSD-SD2 and E-Link IEEE interface combination. The former lets you define a dual drive CP/M without any loss of memory. The latter provides a slight speed improvement. Note that neither Quicksilver nor BusCard II will work with the C-64 CP/M cartridge. (Users of the C-64 CP/M cartridge may contact Morton Kevelson, P.O. Box 260, Homecrest Sta., Brooklyn, NY 11239 for more information on CP/M and the C-64.)

E-LINK

Application: VIC 20, C-64, Plus/4, C-16, C-128
Progressive Peripherals and Software
2186 South Holly, Suite 400
Denver, CO 80222
Phone: 303-759-5713
Price: $99.95

The E-Link is the simplest of the

IEEE interfaces we examined. This simplicity refers to its operation and not its construction. Internally it is at least as complex as any of these devices. It is a no-frills unit which plugs into the disk drive serial port just like a printer interface. It is the only IEEE interface which will work with the VIC 20, C-64, Plus/4, C-16, and C-128 computers. (The last in both C-64 and C-128 modes.) It is the only interface which works with the C-64 CP/M cartridge. This is because it fully emulates a serial port device when in use.

THE HARDWARE

The E-Link is housed in a plastic VIC 20 cartridge case. It is equipped with its own power supply, similar to a portable radio battery eliminator. This compact power supply provides 9 volts DC at up to 500 milliamperes to the onboard 5 volt regulator. Since the voltage regulator is inside the E-Link housing, it will get warm in use. The E-Link installation should allow for proper ventilation. The power supply, which plugs directly into a 120 volt wall outlet, is linked to the E-Link via a lightweight ten-foot wire. Since the power supply does not have an on/off switch, you should unplug it when not in use. This will greatly extend the life of the system.

The only other connections to the E-Link are a five-foot cable terminated in a disk drive serial bus connector and a PET style IEEE edge card connecter (which is not gold plated). Herein lies a problem. Since the E-Link does not extend the disk drive serial bus, it will have to be the last peripheral on the serial bus chain. If this position is already occupied by a printer or printer interface, a conflict will most likely exist. These peripherals generally fail to extend the disk drive serial bus as well. To get around the problem we constructed a serial port "breakout" box complete with selector switch. Users of multiple serial port peripherals should also observe the five device limitation on this bus.

Internally, the E-Link is like any other intelligent Commodore peripheral. It has its own 65C02 micro-

TABLE 4—IEEE INTERFACE PERFORMANCE

Test	1541	SFD-1001	MSD SD-2
Load 30K	77		
w/Quicksilver		17	35
w/BusCard II	(note 2)	24/33	37/59
w/E-Link		45	61
Save 30K	83		
w/Quicksilver		31	61
w/BusCard II	(note 2)	31/39	63/85
w/E-Link		43	84
Scratch 30K	16	7	14
Format Disk	78	150	17
CP/M Boot (see text)			
Serial Bus			35
E-Link			27

Notes:
1. All times are in seconds
2. Dual times shown for BusCard II are with/without BASIC 4.0.

processor running at one MHertz (one million cycles per second). The operating system is stored in four kilobytes of ROM. Communications are handled by a 6522 VIA (versatile interface adapter) chip.

To hook up the E-Link to your IEEE-488 peripheral you will need a PET to IEEE cable. This accessory should be available from your Commodore dealer. We have encountered some difficulty in finding one at this time.

Operation of the E-Link is straightforward. It neither adds to nor subtracts from the Commodore BASIC or DOS. It causes all IEEE peripherals connected to it to behave as serial port peripherals. The usual conflicts with device numbers will apply. If your SFD-1001 is set to device number 8, then your 1541 on the serial bus will have to be something other than 8. Operation of the SFD-1001 disk drive with the E-Link resulted in a two-to-one speed improvement as compared to the 1541. This is very good for a serial bus peripheral with no modifications to the host computer.

QUICKSILVER

Application: C-64
Skyles Electric Works
231E South Whishman Road
Mountain View, CA 94041
Phone: 800-227-9998
Price: $139.00

Quicksilver is an enhanced IEEE interface for the Commodore 64. When installed in the expansion port of the C-64 it adds an IEEE-488 peripheral port while retaining the use of the expansion port. It is another Bryce Nesbitt creation (see the 1541 Flash in the July issue). Of the interfaces we examined, it provided the fastest disk operation with the SFD-1001 disk drive.

THE HARDWARE

Quicksilver is housed in a VIC 20 cartridge case (there do seem to be quite a few of these still floating around) with about 50% of the circuit board extending fore and aft. The forward part of the board is configured as a 50-pin edge card plug (not gold plated) which mates with the C-64 expansion port. To complete the installation the insides of the C-64 will have to be exposed so that a miniature test clip may be connected. The hookup point is done at a resistor (R-44) which terminates on bit 0 of the 6510's onboard I/O port. The installation instructions are supplemented by three clear photographs which depict the various incarnations of the C-64 circuit board. Anybody who can open up his C-64 should be able to install Quicksilver in about 10 minutes without any difficulty.

The C-64 internal connection is to the control line which is designated HIRAM in the C-64 operating system. This handles the access to memory in the $E000 to $FFFF address range.

This arrangement combined with a clever bit of hardware and software trickery allows Quicksilver to peacefully coexist with the C-64 operating system. Operation should be totally transparent to most software.

The back end of the circuit board is equipped with an extension to the cartridge port for use with other C-64 cartridges. There is also a handy little reset pushbutton for reinitializing the computer. A set of four miniature switches lets you configure the board for your system. The first switch turns Quicksilver on or off. The second switch sets device 8 to the IEEE bus. The third switch sets devices 9 and 10 to the IEEE bus. The last switch sets device 4, usually a printer, to the IEEE bus. All other device numbers remain at their original ports. This should provide enough flexibility for any system. To top it off you can duplicate some device numbers. A simple POKE switches data transfers between the IEEE-488 and serial bus. Thus you can conceivably LOAD from a 1541 as device B and SAVE to an SFD-1001 also as device 8.

Connection to the IEEE device is via a built-in length of ribbon cable terminated in a single-ended IEEE connector. If your system has only one IEEE device, you will not need any additional cables with Quicksilver. Additional IEEE devices will require an IEEE to IEEE cable for each one.

Internally, Quicksilver uses a minimum of silicon to accomplish its functions. Its custom operating system lives on an eight kilobyte ROM. Communications are handled by a 6520 peripheral interface device (PID), forerunner of the 6522 versatile interface adapter (VIA). A pair of low power logic chips provide the remaining hardware support.

USER SUPPORT

Quicksilver is more than an IEEE-488 interface. It adds several handy enhancements to the operating system. To begin with, a complete DOS wedge is immediately online. This allows for the usual non-destructive directory displays, easy disk error channel reads, simple disk command issuance, and

single key LOADs and SAVEs.

Several keyboard enhancements are provided. For example, the left SHIFT key or SHIFT LOCK will pause a program listing. All keys will auto repeat. Quote mode may be easily cancelled. The remainder of a line or screen can be easily cleared.

Quicksilver includes a built-in machine language monitor. It can be entered at startup by holding down the Commodore key when the C-64 is turned on. This will also bypass an autoboot cartridge which may be installed at the time.

Perhaps the most unique Quicksilver enhancement is the NMI debugger. This can be set to print the entire processor status on the screen whenever an NMI (non-maskable interrupt) occurs or when the RESTORE key is pressed. This can be invaluable in tracking down the cause of a system crash or the operation of erroneous machine code.

The price of all these enhancements will be trivial for most disk users. All of the Kernal's tape routines have been removed. Of course, they can be easily restored by simply turning Quicksilver off.

Quicksilver claims to be compatible with the 1541 Flash! We were unable to verify this as we lack a Flash! However, a combination of Quicksilver and Flash! should be the fastest way to get around a system with a 1541 disk drive and an SFD-1001.

BUSCARD II

Application: C-64
Batteries Included
17875 Sky Park North
Irving, California 92714
Phone: 416-881-9816
Price: $199.95

The BusCard II is the deluxe IEEE-488 interface in this group. It has about as many ports as you can shake a disk at. In terms of overall features it is nearly on par with Quicksilver, depending on how you may count your features. In terms of speed it runs a close second. If your printing needs are modest, then BusCard II can handle your printer interface needs as well. It includes a built-in parallel printer interface port.

THE HARDWARE

As we mentioned above, BusCard II is positively bristling with ports. There are two on the back, one to the right, and one to the front. This last one is the usual 50-pin printed circuit edge card plug (gold plated) which mates with the C-64 expansion port.

The complete hookup requires that a miniature test clip be attached to resistor R-44 (just like Quicksilver). Unfortunately the photographs in the manual were so indistinct that they could have been left out for all the good they will do. Installation is simple nonetheless. R-44 is one of a group of three resistors situated online nearly due south of the disk drive serial port on the C-64. The resistor is clearly labeled and should be easy to spot. If you can open your C-64, BusCard II can be installed in about 10 minutes or less.

The port on the rightmost edge of BusCard II is an extension to the expansion port for use by an additional C-64 cartridge. The leftmost port at the rear is the parallel printer interface. If you are going to hook up a printer you will need the BusCard printer interface cable available from Batteries Included. This is a minimum interface in that it does not do any graphics emulation or BASIC listing translation. However, BusCard II can be set to translate PET ASCII to standard ASCII if desired. This is sufficient for most word processing applications.

The remaining port at the right rear is the PET style IEEE connector. You will need a PET to IEEE cable to complete the hookup. For some reason, Batteries Included does not offer to supply this cable.

A set of eight miniature switches is directly accessible at the top of the interface. These allow individual selection of devices 4 to 10 as either C-64 serial bus or IEEE-488. Device numbers 11 and up are permanently assigned to the IEEE bus. Device four actually has two switches dedicated to it. These work in conjunction with the supplementary printer port mentioned above. The four possibilities for device 4 are serial port, IEEE, parallel with ASCII translation, and parallel without

ASCII translation.

Since the switches are continuously read, they may be used to operate duplicate device numbers. For example, device 8 could be assigned to a 1541 disk drive as well as to an SFD-1001. Or you may connect three printers as device 4: one to the serial port, one to the IEEE port, and the last to the BusCard II parallel port.

Internally, BusCard II has an impressive collection of etched silicon. The operating system is on eight kilobytes of ROM with an extra 256 bytes of ROM on the side. Interfacing is through a 6821 Peripheral Interface Adapter and a 6532 RIOT (RAM-I/O-Timer) chip. This last chip contains 128 bytes of RAM, two bi-directional ports, and a built-in timer (definitely a riot). Several low power logic support chips complete the picture.

This collection of hardware lets BusCard II run very transparently to the C-64 operating system. By sensing the status of the HIRAM line, BusCard II can actually switch itself in and out as required. This operation is similar to that performed by Quicksilver mentioned above.

USER SUPPORT

The BusCard II operating system adds all of the BASIC 4.0 disk commands to the C-64's BASIC 2.0. These commands are equivalent to a DOS wedge enhancement. The BASIC 4.0 commands may be easily turned on or off by a SYS call in immediate mode. Interestingly enough, when BASIC 4.0 was active the BusCard II disk operations were noticeably faster, as shown in Table 4.

BusCard II incorporates a machine language monitor in its operating system. This provides the usual MLM functions such as memory display, simple disassembly, and single line assembly. Memory from $EC00 to $EFFF is off limits to the MLM because of the BusCard II memory control scheme.

BusCard II is a nicely finished piece of hardware. Its IEEE disk drive operation with the SFD-1001 was quite impressive. Add a printer interface port to the package and you end up with a real bargain.

LINEOUT

For the C-64

By Buck Childress

You finally finished removing those unwanted lines from that soon-to-be masterpiece. It really wasn't too physically demanding. But, after typing in unwanted line numbers and hitting the RETURN key several dozen times, you're beginning to suspect an advanced case of rigor mortis has a grip on your fingers and (perish the thought) brain.

Your suspicion turns to conviction when you list the final version. While in that comatose state, you inadvertently dumped several lines you wanted to keep. Oh, oh…there goes the blood pressure. Gee, that monitor sure looks strange wearing a cowboy boot!

If you're tired of slipping in and out of the fourth dimension, *Lineout* may be just what the doctor ordered to calm the savage beast. *Lineout* will automatically eliminate any amount of lines in any increment you choose.

Just load and run *Lineout.* It will ask you for the beginning (B=) and ending (E=) line numbers. Then you're asked for the increment (I=). Let's say you want to eliminate lines 200 through 450 in a particular program and these lines are in increments of 10. Just answer the B= prompt with 200, the E= prompt with 450, and the I= prompt with 10. If you make a mistake, press the INST/DEL key and enter a new answer. Be sure to press RETURN after answering each prompt. It's as simple as that. Now SYS49152, press RETURN, and let the computer do the work while you concentrate on more important things.

Since *Lineout* resides in an area of memory that's free from the actions of BASIC, it will remain undisturbed while you load, save, and eliminate lines in all the programs you want. Just SYS49152 to get 'er rolling. To put on the brakes, press RUN/STOP.

I hope *Lineout* helps make your programming a bit easier. Besides, those boots look better on your feet! ☐

SEE PROGRAM LISTING ON PAGE 130

HIGH-RESOLUTION GRAPHICS: PART 2

BY MARK ANDREWS

Last month we began exploring the fundamentals of bit-mapped graphics: the kind of graphics that professional programmers use to write arcade-style games and other graphics-oriented programs. This month we'll see how to add joystick action to bit-mapped programs.

In a moment, we'll take a look at how joysticks can be programmed in assembly language. First, though, let's briefly review the high-resolution program called BLACKBOARD presented in last month's column. The version of the program presented last month was written in BASIC. The listing on page 122, titled BLACKBOARD.S, is an assembly language version of the same program. BLACKBOARD.S was written using a *Merlin 64* assembler. But with relatively minor modifications, it can be typed and run using any Commodore-compatible assembler-editor system (see your assembler's instruction manual for details).

There are two obvious differences between BLACKBOARD.S and its assembly language counterpart. One is that the assembly language version of the program is much longer. The other is that it runs much faster—as it should, since it's written in assembly language.

One of the most important segments of the assembly language version of the program is the subroutine called BLKFIL that starts at Line 50. This subroutine is used to clear a bit map that starts at Memory Address $2000 and a color map that starts at Memory Address $0400, and to fill the color map with values that will draw a pair of white lines on a black screen. The details of how this process works were explained last month.

The BLKFIL routine works extremely fast because it moves data one "page" at a time. In 6502/6510 assembly language, a "page" is a 256-byte block of data that begins at a memory address divisible by the hexadecimal number $100—for example, the memory addresses $0100 through $01FF make up one page. In the BLKFIL program, the high-order byte of an address block to be filled is defined first, and then a complete page of data is moved. When all full pages have been filled with data, any remaining partial page is taken care of. This technique makes BLKFIL a very high speed routine.

In Lines 69 through 90 of the BLACKBOARD.S program, there is another noteworthy routine: a high-precision 16-bit multiplication program. This routine can multiply two unsigned 16-bit numbers and can handle a product up to 32 bits long. When the routine ends, the low half of the product is stored in a pair of variables labeled MPR and MPRH, and the high half of the product is stored in PRODL and PRODH. This subroutine is used twice in the BLACKBOARD.S program: once in Lines 134 to 148, and once in Lines 160 to 174. Neither of these routines requires the use of a 32-bit product, so neither routine makes use of the variables PRODL and PRODH. But if you ever do need a multiplication routine that can handle a 32-bit product, here is one that fills the bill.

The 16/32-bit multiplication routine is followed by a plotting routine that is much longer, but also runs much faster, than the plotting routine that accomplished the same task in last month's BLACKBOARD.BAS program.

One more point: When you type and run the BLACKBOARD.S program, you may notice that a couple of the equates in the program's symbol table don't appear in the main body of the program. Don't be too concerned about this: these equates, and their functions, will be examined later on in this column.

When you've typed and executed BLACKBOARD.S, you'll see that it works just like the BLACKBOARD.BAS program that appeared last month: it clears the bit map that starts at $2000, sets background and dot colors (you can change them if you like), and then draws a pair of crosshairs on the screen. But be forewarned: all this takes place very fast. So don't blink, or you may miss the action. If you typed and ran last month's BLACKBOARD.BAS program, please run both programs and compare the speeds at which they run. Then you'll see very clearly why high-speed graphics programs simply cannot be written in BASIC, and are usually written in assembly language.

WRITING A JOYSTICK PROGRAM

Now we're ready to take a look at how Commodore joysticks can be programmed in assembly language. As you may know, the Commodore 64 has a pair of joystick ports that are often referred to in Commodore literature as Port A and Port B. The status of Port A can be determined by reading an 8-bit register that resides at Memory Address 56321 (or $DC00 in hexadecimal notation).

Each of the two joysticks that can be plugged into the Commodore 64 has five on/off switches. Four of these

switches correspond to the four primary directions in which a joystick can be moved: up, down, left, and right. If a joystick is moved diagonally, two of these switches will be activated simultaneously, and a diagonal movement of the joystick can be detected. Table 1 shows how the values of your Commodore's joystick switches can be read in BASIC and assembly language programs.

SWITCH VALUE	BINARY VALUE	MEANING
0	0000 0000	No action
1	0000 0001	Up
2	0000 0010	Down
3	0000 0011	None
4	0000 0100	Left
5	0000 0101	Left + up
6	0000 0110	Left + down
7	0000 0111	None
8	0000 1000	Right
9	0000 1001	Right + up
10	0000 1010	Right + down
11	0000 1011	None
12	0000 1100	None
13	0000 1101	None
14	0000 1110	None
15	0000 1111	None
16	0001 0000	Trigger button pressed
17	0001 0001	Trigger + up
18	0001 0010	Trigger + down
19	0001 0011	None
20	0001 0100	Trigger + left
21	0001 0101	Trigger + left + up
22	0001 0110	Trigger + left + down
23	0001 0111	None
24	0001 1000	Trigger + right
25	0001 1001	Trigger + right + up
26	0001 1010	Trigger + right + down
27	0001 1010	None

The second listing that accompanies this column, titled SKETCHER, combines the features of a high-resolution graphics program with those of a joystick-reading program. The SKETCHER routine is a computer version of those plastic, carbon-filled sketching screens that you may remember from your childhood.

If you've typed and executed the BLACKBOARD.S program, you won't have to type the SKETCHER program from scratch. Just change Line 2 of the BLACKBOARD.S program to read

```
2 * SKETCHER
```

and then replace Lines 259 through 296 of the BLACKBOARD.S program with Lines 259 through 424 as shown below.

When you've assembled the SKETCHER program, you can plug a joystick into your computer and see how the program works. By moving your joystick around, you can sketch a picture on your computer screen. Then, by pressing your joystick's trigger button, you can erase your drawing.

In addition to the SKETCHER's bit-mapping and joystick-reading routines, the program contains a few other

Continued on page 146

CREATED BY USERS FOR USERS

PROTECTION REVEALED

ALL C-64

Take command of your software. End the spiral of buying copy-programs. *The Protection Revealed Handbook* unravels the puzzle of software protection. For authors and users — become a master of illusion. Learn how to protect or un-protect your software. Includes a large section on successful BASIC program security. Covers the latest evolution of copy protection techniques. Topics include:

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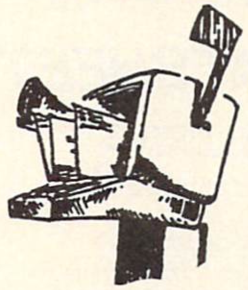
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SCUTTLEBUTT

Continued from page 14

Court, Bloomfield Hills, MI 48013.

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The *Greyhound Racing Analysis Package* ($29.95) and the *Enhanced Greyhound Racing Analysis Package* ($49.95) allow the handicapping of greyhound races using past performance information as taken from the greyhound racing program. Also included is a Bet Return Analysis program for calculating winning percentages. The Enhanced version analyzes 12 data items for a more detailed evaluation of each dog, including track length-distance, track length-last race, post position, odds, times, positions in the stretch, and finish positions. On disk or cassette for the VIC 20, C-64, or C-128.

Software Exchange, 2681 Peterboro Rd., P.O. Box 5382, W. Bloomfield, MI 48033 (phone: 313-626-7208).

COOKBOOKS ON DISK

Concept Development Associates has whipped up five new disks for use with the Micro Kitchen Companion for the C-64. Each of the five disks, which cover French, Italian, Chinese, Mexican, and American cooking, contains up to 180 recipes contributed by 105 of the top chefs in America. Each chef put together a complete full-course dinner from appetizer to dessert. Recommended wines are included for each course as well. Price is $9.95 each.

For a complete catalog call 1-800-443-0100/ext. 403 or write CDA Customer Service, 7960 Old Georgetown Road, Bethesda, MD 20814 (phone: 301-951-0997).

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LinTek Computer Accessories, P.O. Box 8056, Grand Rapids, MI 49508 (phone: 616-241-4040).

COMPUTER CASES

A line of carrying cases for microcomputers and printers from Computer Coverup, made of padded Cordura nylon, contain velcro-sealed outer pockets for storage of disks and supplies, adjustable shoulder straps, and reinforced handles.

Computer Coverup, Inc., 1740 N. Marshfield, Chicago, IL 60622 (phone: 312-276-9007 or 1-800-282-2541).

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CADET'S COLUMN

A Tour of CompuServe's Commodore Information Network

By Cheryl Peterson

In last month's column, we touched on a public domain program that could be found in one of CompuServe's data libraries. This month, we're going to take a tour of the area where that program was found: the Commodore Information Network (CIN). Good reasons for finding our way there include the many Commodore users who visit it (some of whom are bound to share our interests); system operators (SYSOPS), who are knowledgeable about Commodore computers and who are happy to help new users with any problems they encounter; conference visits by Commodore representatives and engineers that give everyone the chance to air their views; and the data libraries that contain a multitude of programs and help files. Run by Commodore employees and users, the CIN gets the latest news on product development and third party vendor support.

To get to the CIN, you need a 300 or 1200 baud modem, a software package for communication, a computer (any Commodore will do), and a CompuServe user number or starter pac.

Once you've gotten past sign-on, there are several ways to get to CIN. At the ! prompt, you can enter G CBM, which will take you to a menu offering access to the areas in CIN. Option 5, the Special Interest Groups/Forums, is the place to find friends, help, and free programs, so we'll start there. I'll get into the other areas later.

If you want to avoid the main menu and go straight into the SIG (Special Interest Group) of your choice, you enter a different command. For The Commodore Forum, enter GO CBM963. To get to the CBM Programming SIG you enter GO CBM310. And the CIN Creative Corner is accessed by typing GO CBM962.

The Commodore Forum is probably the best place to start. Here, a nightly CO (conference) at 10 pm EDT gives members a chance to interact directly with each other. For those who've never experienced a CO, it's a fantastic way to communicate with a group of people and hear what everyone has to say. To get to the CO you enter "CO" at the **Function:** prompt. After a short pause, you should see a notice welcoming you to Channel 30 and telling you how many other people are tuned in. For most CO's, everyone will be on Channel 30. Almost immediately you should see messages start to appear on your screen.

Now comes the tough part—how you can get in on the conversation. Type something on your keyboard and then hit return. Everyone else who is tuned in will see your message on their screens within a few seconds, so try to make it something friendly like "HI!". Unless you tried to be terribly verbose and entered a message that had more than 80 characters, you should see a bunch of folks cheerfully returning your greeting. If you exceeded the 80 character limit, you'd get an error message.

If you'd like to participate incognito, you type a /han. By the way, all CO commands must be prefaced with a "/", since this is how CIS tells the difference between messages to other users and commands to the system. The system will ask what your handle is. Type in something other than your name. If you happen to see someone using the handle "Cherp," there's a reasonable chance you've run into me. If you want to find out for sure, type /ust. This user status command will generate a list as in illustration 1. If it's me, the listing for the person using the Cherp handle will probably have an MIA listed under the node column. (Of course, you could always ask. Everyone talks to everyone else and I'm just as talkative as the rest.)

Job	User ID	Nod	ChTlk Handle
10	72775,1041	T04CVK	ACCESS
26	76703,2060	FYN	1Moderator
34	72366,2645	MIA	1Cherp
35	74306,2714	DCI	1LOG
40	72507,3051	LAK	1128 Maniac
43	72157,2361	CAP	1Mike
50	76703,2047	FYN	1Jeff @ CBM
62	72247,3454	BOT	1J. Williamson
65	76703,2047	FYN	1Bil Herd
75	72416,2511	LSM	1Mark
80	73615,1156	SEA	1Betty Knight.
85	70726,1222	PPA	1Jeff
86	74025,636	QBA	1Larry P
92	76703,2045	ATJ	30SYSOP/Dave Stewart

Illustration 1: /UST listing

Probably the nicest feature of the CO's is the direct interaction with people who have a similar interest. If you have a question about some aspect of the Commodore computers someone in the CO may be able to help. If no one knows exactly what you're after they can frequently point you in the direction of someone who does. When the group is completely stymied, they'll send you to the appropriate section of the message board.

The message board is the place you came through on the way to CO. The **Function:** prompt recognizes lots of other commands besides CO. Most of them have something to do with reading the messages on the "boards." (See illustration 2.) Each SIG has 11 sections assigned different topics to coincide with user interests. Section 10 of each is the system operator's (SYSOP's) private board.

A short word about SYSOPs. The

COMPUSERVE OFFERINGS

Adapted from the CompuServe Information Service Fact Sheet

CompuServe offers information on topics from high finance to high fashion, more than 100 interactive forums, games, bulletin boards, a shopping mall, travel agencies, an encyclopedia, a news clipping service, tax tips, reference materials, newspapers, weather reports, gossip columns, magazines, and much more.

COMMUNICATIONS AND BULLETIN BOARDS

EasyPlex Electronic Mail links online friends and business contacts with instantaneous communication. The CB Simulator, high technology's partner to CB radio, puts people of all backgrounds, ages and intellects in touch with one another. Forums covering topics ranging from firefighting to medicine provide a unique setting for contributors to exchange ideas and information online.

NEWS, WEATHER AND SPORTS

The complete AP news service, *USA Today*, *The Washington Post* and the *St. Louis Post Dispatch* are some of the newsgathering outlets that put daily and latebreaking information within reach of any computer user.

ELECTRONIC SHOPPING

The Electronic Mall is an online shopping center that enables users to shop at dozens of stores such as Bloomingdale's, Waldenbooks, and Record World without leaving home. Comp-U-Store is a discount home shopping service that includes brand name items such as TVs, kitchen appliances, sporting equipment, and more. In both services, users will find discount prices and special sales.

FINANCIAL TRANSACTION SERVICES

Several banking institutions have put their services online, enabling customers to review transactions, transfer funds, and pay bills electronically. There are discount brokerage services available through the nationally known firms of Quick & Reilly and Max Ule, Inc.

TRAVEL

Some of the travel services available on CompuServe make travel easier, quicker, and less expensive. On Travelshopper booking flights, comparing airfares, and arranging for ticket delivery is just a keystroke away. The A-Z Worldwide Hotel Guide provides its reservation information and lodging descriptions of more than 25,000 hotels worldwide.

ENTERTAINMENT AND GAMES

Trivia buffs can enjoy the Multiple Choice, video game experts can battle each other, and computer and word wizards can match wits with Word Scrabble and Whiz Quiz. A number of board and card games can keep users entertained.

HOME, HEALTH AND FAMILY

Financial, medical, legal, tax, and other areas of home management and family concern are addressed by a wide range of CompuServe offerings. Databases are continually updated to provide the most current information.

MONEY MATTERS AND MARKETS

In the time it takes for investors to sift through the pages of financial publications, CompuServe users have access to a wealth of financial information. The database includes specific data on stocks, bonds, mutual funds, options, major market and industry indices, commodities markets, and publicly-owned companies. Utility programs perform portfolio valuation, screen historical data by selected criteria, create charts, report market highlights, calculate portfolio returns and provide historical quotations. A number of forecasting databases give users access to the same sources tapped by Wall Street analysts.

EDUCATION AND REFERENCE

Through reference texts such as Grolier's Academic American Encyclopedia, education-related databases, and forums, students can sift through information that would otherwise require a trip to the library. Aspiring college students can take sample tests to prepare for the SAT and College Boards and get information on colleges, grants, and financial aid, and application and recruiting policies.

```
Function:?

Functions:
B      – bulletins      CO – conference
D      – delete         DL – data libraries
E      – exit           G x– go to page x
I      – instructions
L      – leave a message
M      – previous menu
MI     – membership information
NEW    – new/changes
OFF    – log off        OP – set options
QS     – quick scan     R  – read messages
R x    – run SIG x      RT – read thread
S      – scan headers
SD     – scan & display
SEN    – send a message
SN     – sub-topic names
SS     – set sub-topic
T      – go DISPLA      U  – user log
UST    – current users
V      – interests      X  – database

? x    – explanations of function x
```

Illustration 2: Function: options

CompuServe SIG's are similar to privately operated Electronic Bulletin Board systems running on personal computers in many cities. With some big differences: regular users are from all over the country, many people can be on the board at once, and there are usually a group of SYSOPs who don't "own" the board. SYSOPs do, however, regulate how the board is run. For the most part, they are friendly and helpful—only too happy to make new users feel at home. This can mean answering any questions you have to just sending you off to leave a message in the public message forum section most appropriate for your query.

There are a few actions that will get them riled fast. Most object to obscene language, condescending messages, and unflattering comments about any of the users. They also don't like to see copyrighted software uploaded into the data libraries. They have the power to "squelch" any users who are in CO. They can ban any user from accessing the board and if they really get offended could have a user thrown off CompuServe altogether.

Anyway, back to the boards. The central SIG feature, the message base, is set up along the same lines as many local bulletin board systems. Messages can be left to any or all other members and anyone checking into the SIG can read all the messages that haven't been saved as private files. To read the messages, you type R at the **Function:** prompt. The system will then tell you the message numbers that are active and request a starting message number. After you type in a number, the message you've chosen will start scrolling by on the screen. At the end of it, a prompt allows you to reply or to quit reading messages. The prompt **(UA RE T)** represents the alternatives Unrelated Answer, Reply, and Terminate. Entering just a carriage return will call up the next message. By repeating the process, you can read all the messages on the board. For now, you should probably just concentrate on reading some of the messages.

Of course, once you've been around CIS for a while you pick up a few tricks. If you type RTN at the function prompt (Read Thread New), the messages will appear in a more sensible order. Instead of scrolling by in the order they were entered, all the messages related to a given topic (thread) will be displayed oldest to newest. The N stands for New, so only those messages added since the last time you read through the board would be shown. Once you've signed in as a member of a SIG, look for membership instructions under MI at the **Function:** prompt—the board will remember the last message you've read each time you leave the area.

The QS (quick scan) command will display the topics of threads currently active and their starting message numbers, making it easy to read only threads whose subject appeals to you. SS (Set Section) restricts your activities to only the section number you designate. This allows you to limit the amount of time you spend reading messages in topic areas that don't interest you. For example, you might only be curious about the new 128 and want to read only the messages in the C-128 Info Center (section 9) in the Programming SIG. An SS9 is all you need to lock out the other sections. An RTN at that point would display messages only from section 9. An SN command will dis-

play the names of all the sections.

Now that you know how to see what everyone else is saying, let's run over to those data libraries (DLs) and see what they have for us. Get back to the **Function:** prompt and type X1. This will give you a short description of DL1. The DL numbers are set up to correspond with the section names. Since some programs or help files apply to more than one topic, there is occasional duplication of files. After the description, you return to the **Function:** prompt. To get into a DL, you type DL and the section number you want.

Since there are three SIGs, there are also three separate DLs each with 11 sections. The fastest way to see what is included in each DL is to type DIR at the **DL#:** prompt. The # sign in the prompt represents the DL number you are in. This command gives a listing of the files, their size, and CIS number of the person who uploaded them. (See Illustration 3.) This information isn't terribly useful, since the filenames don't always make it obvious what the file is. If you're good at guessing games, you might like to try to figure it out.

There is a better (although more expensive) alternative. Type BRO DL#.DIR at the **DL#:** to search for the file DL#.DIR. When the system finds it, it gives a short description of the file. See illustration 3 for a sample description. The prompt **(R D T)** represents Read, Download or Terminate. For this file it's best to open the buffer of your terminal package and just read the file. Since it's a text file, it doesn't need to be downloaded as a program. In fact, you might want to open the channel to your printer and just print it out there.

```
[76703,2054]
DL2.DIR        03-Aug-85 61310       98

      Keywords: DL2 CATEGORY DESCRIPTION
                 DATA LIBRARY 2

  This is the current description of all files
here in DL2 - High Level
  Utility. It has been formatted in 80 columns
for printing and later
  reference. Current as of August 3rd 1985.
```

Illustration 3: Description of a data library directory file.

After you've read the file, you can save it to disk on your computer for later use. Or format it for a nice pretty printout. I will warn you, these files are long. Most take about 15 minutes to read. A ↑ P at any point will stop the listing and get you back to a prompt you'll recognize. The listings start with the latest files and work backwards in time, so you get the most recent files first.

The files on CIS fall into two basic categories: text files and programs. Text files usually have extenders like DOC, TXT, or SEQ. Programs usually end with IMG or BIN. The former can be read and buffered; the latter need to be downloaded. Downloading can be ridiculously easy, moderately easy, or impossibly difficult, depending on what software your Commodore is running.

If you use the Vidtex program sold by CompuServe (or another CIS "B" protocol compatible program), downloading is simple. Use the "GO DEFALT" command to tell CompuServe you're using their protocol. You'll have to negotiate two menus to set the DEFALT to "Vidtex compatible." Once that's done, all you have to do is go to the data library of your choice, BRO (browse) through until you find a file you want, and choose the D at the **(R D T)** prompt. When the screen prompts you for the name to save the file under, type in a legal file name. It's a good idea to give a name that means something to you. Hit the RETURN key and wait for the system to do its thing. CIS does an automated transfer, meaning that it controls the whole process including writing the file to disk for you. When it's done, you'll see the file description repeat and the prompt **(R D T)**.

If you don't use DEFALT to let CompuServe know that you are using its protocol, it will give you a four-option menu before starting the

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download. Using the CIS "B" protocol functions the same as described above. The other popularly used protocol is Christensen's XMODEM protocol. Many commercially marketed programs and most public domain terminal software use this protocol. Depending on the software package you are running, there will be some commands you use to start file transfer. You'll have to check your documentation to see how your software works.

One advantage of XMODEM is that it divides the file into parts and sends each part with a special code called a checksum. The receiving software does a calculation on each part and checks the result against the checksum. If the two numbers don't match, the part (block) is resent and the receiving computer throws out the block with the error in it.

The X-On/X-Off choice is the protocol of last resort, since it doesn't do any error checking. The sending computer (CIS) just sends the data out. If it receives a signal from the other computer to stop (X-Off), it pauses until it receives a resume command (X-On). Although this works, if there is any line noise or bits are dropped, the corrupted file would run erratically.

Update: shortly before this column went to press, Commodore turned the three sections of its information network over to the Toronto Pet Users Group. The commands used to get into the network haven't changed; however, Commodore employees will no longer be running the SIGs there.

Commodore has started a smaller technical support area that can be reached by using "GO CBM-2000". The system operators from the old network will be running the new technical support area. This area's section names are contained in illustration 4.

Starting this month, I'll be available on the new expanded Viewtron service. We are in the process of setting up a special area on Viewtron just for Commodore users. Since I have been asked to be a SYSOP for the system, I'll have the latest word on what could turn out to be CompuServe's biggest competition. My user number there is 58357CCP? I'm going to be handling the beginner's section there. Feel free to visit and leave me any questions you may have. I'll do my best to help you out. I'm always interested in your opinions on both my columns and computing, so let me know how you feel. Any suggestions on subjects for future columns would be appreciated. ☐

Commodore CBM-2000

The Commodore Forum

0 General/Help!
1 The Commodore 64
2 The Commodore 128
3 The Amiga from CBM
4 Other CBM Computers
5 Software
6 Programming
7 CBM Magazines
8 CBM User Groups
9 News from CBM

Illustration 4: Section listing from Commodore technical support area.

COMMODARES

PROGRAMMING CHALLENGES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o *Ahoy!*
P.O. Box 723
Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible, where appropriate. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #24-1: PRINTING PERMUTATIONS

This problem was suggested by Bill O'Rourke (Crystal River, FL). Simply stated, the user specifies a quantity, and the computer prints out every possible arrangement of that many numbers. For example, if the user specifies 3, the computer prints out the six possible permutations of three numbers (not necessarily in this order): 123 132 213 231 312 321. Nearly trivial, you say?!

PROBLEM #24-2: PYRAMIDAL PRINTOUT

Here's one from Nolan Whitaker (Jeffersonville, KY). The user enters any word that begins and ends with the same letter. The computer makes a pyramid out of the word. If the word is "DARED", the output is

```
        D
      A   A
    R       R
  E           E
D   A   R   E   D
```

PROBLEM #24-3: FRACTIONAL FUN

Jim Speers (Niles, MI) suggested the reverse of *Problem #20-3: Decimal Endings* which is discussed this month. Given a repeating decimal such as 0.12345345... write a program to calculate its fractional equivalent. The repeating decimal must begin with not more than two non-repeating digits, and the number of repeating digits must be six or less. (The answer to the example is 12333/99900 or 4111/33300 in lowest terms.)

PROBLEM #24-4: SECTOR STATUS

The user specifies a diskette track and sector number. The computer responds "unused" or "used" to indicate whether that sector is available or not. BASIC only. Briefest is best. Explain your solution.

There were many responses to *Problem #20-1: Screen Scramble II!* !II elbmarcS neercS : 1-02# melborP ot sesnopser ynam erew erehT

The most common mistake of the "one-liners" was to POKE the upper left corner of the screen into the lower right corner of the screen without first saving the lower right corner. Those solutions looked like this:

```
10 FOR S=1024 TO 2023 : POKE 2023-C,PEEK
(S) : C=C+1 : NEXT
```

A correct solution looks like this:

```
10 FOR S=1024 TO 1523 : M=2023-C :T=PEEK
(S)
20 POKE S,PEEK(M) : POKE M,T : C=C+1 : N
EXT S
```

Can you figure out what would happen if the 1523 in line 10 were replaced with 2023? The 1523 is the middle and 2023 is the end of the C-64 screen memory. VIC users must substitute values for the VIC's screen memory.

Readers used various places (besides the single variable T above) to store the data temporarily before rewriting it in reverse order to the screen. Some readers used arrays, others POKEd to free memory, and Paul Haynes (Flour Bluff, TX) used a sequential disk file. The disk file method is not the fastest way to reverse the screen, but it has the advantage of saving the screen image on

disk for future reference. Paul's solution is listed below.

```
5 REM SCREEN SCRAMBLE II BY PAUL HAYNES
10 OPEN 5,8,5,"SCREEN,S,W" : FOR X=1024
TO 2023 : PRINT#5,PEEK(X) : NEXT : CLOSE
 5
20 OPEN 5,8,5,"SCREEN,S,R" : FOR X=2023
TO 1024 STEP-1 : INPUT#5,A : POKE X,A :
NEXT : CLOSE 5
```

You must save the color memory in addition to the screen memory in order to reproduce the original image. The color memory byte is at (X + 54272) for the C-64. You should be able to modify Paul's program to save and restore the color memory as well.

Ryan Yoder (Ft. Wayne, IN), James Speers (Niles, MI), and Randal Swenson (Mesa, AZ) sent machine language solutions. Randal's is for the unexpanded VIC 20. Ryan's solution for the C-64 uses 83 bytes and executes in 0.067 second! Ryan's program is contained in BASIC DATA statements, and Randal's is an assembler source code listing. James' C-64 solution is in BASIC DATA statements, and it also includes a commented assembler source listing. If you want to see their solutions, send a stamped, self-addressed envelope to *Commodares*. Clearly state the listing you are requesting.

James Dunavant (Gainesville, FL) used a combination of BASIC and an internal ROM 'move' routine. The ROM routine transfers the screen memory up to 49152, and POKE statements move it back to the screen in reverse order. James says that line 110 is slow, but line 100 works in a flash. Line 105 makes things visible on the screen.

```
1 REM PROBLEM #20-1: SCREEN SCRAMBLE II
2 REM SOLUTION BY JAMES DUNAVANT
3 REM
100 POKE781,4:POKE782,232:POKE91,7:POKE9
0,0:POKE89,195:POKE88,0:SYS41964
105 POKE53281,1:PRINT CHR$(147):POKE5328
1,0
110 FORI=50151TO49152STEP-1:POKE1024+C,P
EEK(I):C=C+1:NEXT
120 GOTO 120
```

James Speers (Niles, MI) came up with a very interesting solution. His program moves the screen memory to another memory location in reverse order. He then uses the screen memory page flipping technique to switch between screens. Press any key and the screen is instantly restored in line 110. You may rapidly flip screens by pressing any key. Pressing the "*" key once or twice will restore the screen to normal and exit the program. This is certainly a "flashy" little program!

```
1 REM PROBLEM #20-1: SCREEN SCRAMBLE II
2 REM SOLUTION BY JAMES SPEERS
3 REM
10 FORI=0TO999:POKE13287-I,PEEK(1024+I):
POKE55296+I,1:NEXTI
20 POKE53272,PEEK(53272)AND15OR192
100 GETZ$:IFZ$=""THEN100
110 POKE53272,PEEK(53272)AND15OR16
200 GETZ$:IFZ$=""THEN200
210 IFZ$<>"*" THEN 20
```

Among the other readers with solutions to this problem are Paul Mather (Warminster, ONT), W.T. Mallison (Rocky Mount, NC), Michael Mills (Corbin, KY), Nolan Whitaker (Jeffersonville, KY), Dennis Furman, Steve Smith (Elkville, IL), Mark Maples, Mark Tillotson (Tulsa, OK), Jim Maloney (Pittsburgh, PA), Jim O'Brien (Warminster, PA), Matt Drown (Concord, NH), Allan Flippin (San Jose, CA), and Wallace Leeker (Lemay, MO). Two Warminsters!

Problem #20-2: Numeral Converter was a bit more involved than some of the other challenges, consequently the solutions are somewhat lengthy. The two programs printed below were chosen for differing reasons. Michael Marron's solution is straightforward and easy to follow. Michael said that the program could easily be extended to billions, etc. You might give that a try.

```
1 REM PROBLEM #20-2: NUMERAL CONVERTER
2 REM SOLUTION BY MICHAEL MARRON
3 REM
50 DIM D$(30),D(30)
60 FOR I=1TO27:READ D$(I),D(I):NEXT I
```


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```
70 INPUT"ENTER NUMBER IN WORDS";N$:L=LEN
(N$):WB=1
80 FOR I=WB TO L
90 L$=MID$(N$,I,1):IF L$=" " THEN 120
100 W$=W$+L$
110 NEXT I
120 IF W$="HUNDRED"THEN N=N*100:GOTO180
130 IF W$="THOUSAND" THEN N1=N*1000:N=0:
GOTO 180
140 IF W$="MILLION" THEN N2=N*1000000:N=
0:GOTO 180
150 FOR J=1 TO 27
160 IF W$=D$(J) THEN N=N+D(J):GOTO 180
170 NEXT J
180 IF I=L+1 THEN PRINT N2+N1+N : END
190 W$="" : WB=I+1 : GOTO 80
200 DATA ONE,1,TWO,2,THREE,3,FOUR,4,FIVE
,5,SIX,6,SEVEN,7,EIGHT,8,NINE,9,TEN,10
210 DATA ELEVEN,11,TWELVE,12,THIRTEEN,13
,FOURTEEN,14,FIFTEEN,15,SIXTEEN,16
220 DATA SEVENTEEN,17,EIGHTEEN,18,NINETE
EN,19,TWENTY,20,THIRTY,30,FORTY,40
230 DATA FIFTY,50,SIXTY,60,SEVENTY,70,EI
GHTY,80,NINETY,90
```

The most mysterious solution to this problem was submitted by Dennis Furman (Edwards, CA). Dennis said that his program accepts a number such as 2400 as either "twenty four hundred" or "two thousand four hundred." Can you figure out the meaning of the values in the DATA statements?

```
1 REM
2 REM PROBLEM #20-3 : NUMERAL CONVERTER
3 REM SOLUTION BY DENNIS FURMAN
4 REM
10 DIMU(32),D(32)
20 FORI=0TO31:READU(I):D(I)=I:NEXT
30 T=0:TT=0
40 GETN$:IFN$=""THEN40
50 PRINTN$;:A=ASC(N$)
60 IFA=32ORA=13THEN80
70 C=C+(B+1)*(A-64):B=B+1:GOTO40
80 FORJ=0TO8:IFC<>U(J)THEN100
90 T=T+D(J+1):GOTO220
100 NEXTJ
110 FORK=9TO18:IFC<>U(K)THEN130
120 T=T+D(K-9)+10:GOTO220
130 NEXTK
140 FORL=19TO26:IFC<>U(L)THEN160
150 T=T+D(L-17)*10:GOTO220
160 NEXTL
170 FORM=27TO31:IFC<>U(M)THEN210
180 T=INT(T*10^(M-25))
190 IFM<>27THENTT=TT+T:T=0
200 GOTO220
210 NEXTM:PRINT"ERROR":T=0:TT=0
220 B=0:C=0
230 IFA<>13THEN40
240 IFTT=0THENPRINTT:GOTO30
250 PRINT TT+T:GOTO30
260 DATA 58,111,135,171,110,109,185,176,
94,72,241,269,412,448,275,342,506,353
270 DATA 371,387,385,295,247,314,580,326
,344,256,396,1,1,348
```

Other excellent programs were received from Allan Flippin (San Jose, CA), C. C. Stalder (Waynesville, NC), James Borden (Carlisle, PA)—a COMAL solution, Ronald Jordan (Florence, OR), and David Hood (Windsor, NJ).

Problem #20-3: Decimal Endings brought some very fine solutions. Thomas E. Gantner (Dayton, OH) sent his solution as well as a reprint from the *College Mathematics Journal* (November 1984) in which he published an article on "The Computation of Repeating Decimals." The algorithm is based upon the work of the great mathematician C. F. Gauss. Dr. Gantner describes the solution as follows:

> Given a fraction a/b in lowest terms, let M be the number of times that 2 is a factor of b, let N be the number of times that 5 is a factor of b, and let P be the product of the remaining factors of b. Let MAX denote the larger of the two numbers M and N; then there are MAX nonrepeating digits in the decimal expansion of a/b to the right

> of the decimal point, and the decimal expansion terminates whenever P = 1. When P > 1, the period is of length L, where L is the smallest integer having the property that 10 ↑ L − 1 is a multiple of P.

```
10 REM PROBLEM #20-3: DECIMAL ENDINGS
20 REM SOLUTION BY TOM GANTNER (DAYTON,
OH)
25 REM
30 T=10:C=0
40 FOR I=1 TO 100
50 M=0:N=0:L=1:P=I:TER=0:NUM=1
60 P%=P/2:IF 2*P% < P THEN80
70 P=P%:M=M+1:GOTO60
80 P%=P/5:IF 5*P% < P THEN100
90 P=P%:N=N+1:GOTO80
100 MAX=M:IF M < N THEN MAX=N
110 REM MAX = NO. OF NONPERIODIC DIGITS
120 IF P=1 THEN TER=1:GOSUB190:GOTO180
130 X=T
140 Y%=X/P:X=X-P*Y%
150 IF X=1 THEN GOSUB190:GOTO180
160 X=T*X:L=L+1:GOTO140
170 REM L = LENGTH OF PERIOD
180 NEXT I:END
190 REM DIGIT PRINTING ROUTINE
200 IF I=1 THEN PRINT "1/1 = 1  IS AN IN
TEGER":GOTO310
210 PRINT "1/";MID$(STR$(I),2);" = 0.";
220 FOR J=1 TO MAX+L
230 NUM=T*NUM:D%=NUM/I:NUM=NUM-I*D%
240 IF J=1+MAX AND TER=1 THEN300
250 IF J=1+MAX THEN PRINT "'";
260 PRINT MID$(STR$(D%),2,1);
270 NEXT J
280 PRINT "'"
290 PRINT "PERIOD =";L;"AFTER";MAX;"DIGI
TS":GOTO310
300 PRINT:PRINT "TERMINATES AFTER";MAX;"
DIGITS"
310 C=C+1:IF C < 5 THEN PRINT:RETURN
320 GET A$:IF A$="" THEN GOTO320
330 C=C-5:PRINT:RETURN
```

You may modify line 40 to obtain other ranges of numbers. For example, use FOR I=821 TO 821 to see the 820-digit period of the number 821. Also change the 5 in lines 310 and 330 from 5 to 1. You may also modify the program starting at line 200 to send the output to your printer instead of the screen if desired.

The shortest solution to this problem was submitted by Robin King (Queens, NY). Robin's program factors out the 2's and 5's as described in the algorithm above. WN is then relatively prime to 10, and therefore its period of repetition iis the same as for PN. To determine the period, WN is divided into 999...9 (as many 9's as necessary until the remainder is 0). The number of 9's used is the period of repetition of 1/WN and 1/PN. Some study should convince you that both solutions are using the same algorithm.

```
1 REM PROBLEM #20-3 : DECIMAL ENDINGS
2 REM SOLUTION BY ROBIN KING
3 REM
10 PN%=PN%+1 : WN%=PN% : PR%=1 : D%=9 :
IF PN%>100 THEN END
20 IF WN%=2*INT(WN%/2) THEN WN%=WN%/2 :
GOTO 20
30 IF WN%=5*INT(WN%/5) THEN WN%=WN%/5 :
GOTO 30
40 R%=D%-WN%*INT(D%/WN%):IF R%=0 GOTO60
50 PR%=PR%+1 : D%=10*R%+9 : GOTO 40
60 IF WN%=1 THEN PRINT PN%,"TERMINATING"
 : GOTO 10
70 PRINT PN%,"PERIOD OF REPETITION ="PR%
: GOTO 10
```

Congratulations also to Allan Flippin (San Jose, CA), James Speers (Niles, MI), and Steven Gustafson (New Albany, IN) for their solutions and work on this problem.

No one submitted a solution to *Problem #20-4: Hyphen Help.* Several readers stated that they had worked on the problem but that it is a very complicated task. James Speers stated that he is having no difficulty with the BASIC language, but the ENGLISH language is driving him up the wall! We may still welcome and discuss any attempts or comments you may have regarding this problem. Once again, the user inputs a word, and the computer displays all reasonable ways of hyphenating it. It doesn't really sound that difficult, does it? See you next month. ☐

PROGRAMS WANTED

Don't be fooled by the fact that *Ahoy!* comes your way each month packed with the best games and utilities available in any Commodore magazine. We just don't have the mile-high inventory that you might imagine. But we're determined to continue bringing you the type of high quality programs you've come to expect from *Ahoy!* To that end, we've raised our rate of pay for accepted programs, and we've added staff to speed our response to your submissions. There's never been a better time to submit a program to *Ahoy!*

Send your program on disk or cassette (preferably disk), accompanied by an introductory article, a printout, and a self-addressed envelope of sufficient size with sufficient return postage affixed. (Submissions not accompanied by such an envelope will not be returned.)

Address submissions to *Ahoy!* Program Submissions Dept., Ion International Inc., 45 West 34th Street—Suite 407, New York, NY 10001.

FLOTSAM

I enjoyed Orson Scott Card's *Rockets, Boats, & Pigs in Pokes* article in the September '85 issue. He writes clear explanations about how to use the tons of features of the C-64. You ought to give this genius a promotion and make him president of Commodore land.

Thanks for the utility called *Ahoy! Dock* so that all of us can catalogue our Commodore magazines. It will take us about 10 years to do it, but *Ahoy! Dock* sure beats the *Fast Filer* published by *COMPUTE!* magazine in their July '85 issue. They must have all been drunk when they published their simple-minded program requiring you to add thousands of data statements to their BASIC program just to index the Commodore universe! After I spent two days typing in the program and after seeing what it did and didn't do, I re-formatted the disk that I had used. Luckily I came across *Ahoy!* magazine's index. Keep up the good Commodore utilities for the 64!

—Robert Desko
Endicott, NY

In your September '85 issue of *Ahoy!*, Edward Champa writes in *Flotsam* about the compatibility of Epyx *Fast Load* with *Multiplan*. He was told by Epyx that the problem is with relative files. I do not believe this is true. I use it with other programs that use relative files without any problem. I believe the problem is with *Multiplan*. It seems that when you overwrite a file, it erases the old file first, but when it tries to write the revision, it will say "Cannot write file" and you are left with no place to go. This happened to me. Fortunately, I had a backup disk and nothing was lost.

The solution is that after you load *Multiplan*, you must turn off your disk drive and then turn it on again. Evidently *Fast Load* does something in your disk drive and by turning it off and on, you put things back to normal.

This is a solution I found by experimentation. I find that the manufacturers of software and hardware peripherals tend to blame your problems on some other part of your system, never *their* product! —R.H. Schuette
Blaine, MN

I own a Commodore 64 and have it interfaced with the Olivetti PR2300 printer. This printer requires dry ink jet ampules and not a ribbon. I have had trouble finding these ampules. I've read that over 20,000 of these printers have been sold (it can be interfaced to the Apple, IBM PC, Atari, TRS80, VIC 20, Commodore 64, and almost any other home computer).

I have found a reliable source for obtaining the ampules, and realized that many of your readers probably purchased the same printer and would be interested. The name of the company is:

Micro Data Products
P.O. Box 532276
Grand Prairie, TX 75053

I purchased a box of four ampules for $8.95 plus $1.00 for postage/handling, and understand that there is an additional discount for larger quantity purchases.

—E. Mahan
Duncanville, TX

I received your letter yesterday containing the *Errata* info on *Fastnew* (Sept. '85). I'm very pleased and impressed with your quick response to my letter. I completed the changes as described, and am happy to report that the *Fastnew V0316* program works great—no head bang! Thanks again for the speedy response.

I read David Allikas' *View From The Bridge* (Oct. '85) and am delighted with his positive attitude. I, for one, am sick of everyone else's pessimistic editorials and outlook. It's obvious that *Ahoy!* has been working hard to provide present Commodore owners with quality programs, while increasing content too! I've noticed a threefold increase in content over September '84.

I am grateful that *Ahoy!* is continuing to support present Commodore users and applaud your desire to improve your service to Commodore owners. It shows, and is appreciated. Keep it up! —Roman Gumula
North Stonington, CT

GAMELOADER

For the C-64

By Tim Brown

In my household there are a nine-year-old and a five-year-old who are learning to use my computer. They enjoy playing the games and running some of the programs, but with a few we run into a little problem. It's hard for my kids (and sometimes myself) to remember which programs load at BASIC and which load above BASIC. *Gameloader* was written so we won't have that problem anymore.

Normally a machine language program starts at 49152 or some other address above BASIC, and must be executed with a "SYS" command. This requires remembering to load the program in non-relocatable format, i.e.: LOAD"program",8,1. After doing this, you must remember the proper address to "SYS" or it won't execute properly. Trying to get a five- and nine-year-old to remember all these numbers is not easy. *Gameloader* does all the remembering for you.

Gameloader may be used with any program that loads in non-relocatable format (i.e.: Load"programname",8,1) with a known start address, such as public domain ML software. Use of *Gameloader* with software of this nature requires that you know the execution address of the program. One exception is a program that is auto-booting. In this case the execution address need not be known, as the program will execute itself as it loads.

To get *Gameloader* to work for you, just type it in, save it, and run it. You will then only have to answer the prompts for it to construct the loader. The first prompt you will be asked for will be the original program name. Enter this information; then you will be asked the address to "SYS". After entering this information, *Gameloader* will change the name of the original program to the first letter of the original program plus an "x", construct the loader, and save the loader under the original program name. The loader that is created will now load and "SYS" the proper address of the original program. Your program now becomes "(first letterX)". From now on, you can load that program and then just run it.

Now let's examine the program line by line.

Line 5 sets screen and cursor color. These may be changed to suit the user.

Line 10 prints a title to screen.

Line 20 uses INPUT to ask for the name of the program to be converted.

Line 30 asks for the address to SYS. If there is no address given, simply press RETURN.

Line 40 copies the original program name for *Gameloader* and stores the new name in NX$.

Line 50 will ask that you insert the disk into your drive that has the program you want to convert on it.

Lines 60-80 accept a Y/N answer.

Lines 110-117 change the original program name to NX$'s content.

Lines 120-160 are the new loader construction routine, which is printed to the screen and saved automatically.

Lines 9000-9090 is a sound "beep" routine which will sound only when "N" is used.

Now load "original program name",8. When the "ready" prompt appears, simply type "run" and the original program will load and execute without operator intervention.

This simple utility will come in handy in time savings, compared to time spent looking through all the manuals for proper addresses. It is also easily modified. You can add statements to turn on printers before "SYSing" up, and you can add a few lines to set screen colors. On some games you can add codes to set sprite size and make the game even more interesting.

You may notice that this program is similar to an auto run type boot program, but with the auto run boot, you must still remember to load in a non-relocatable format, i.e., Load"Programname",8,1. The user must still remember to type ,8,1 after the program name or the program will not operate. With *Gameloader* all you have to do is Load"Programname",8 then run it, the same as all BASIC programs. ☐

SEE PROGRAM LISTING ON PAGE 129

CLOAK

File Encryptor for the C-64 and VIC 20

By Melvin Baker

While the concepts of data encryption can themselves be fascinating, especially to a computer enthusiast, they can be quite useful in this world of electronic hackery. Perhaps you have some confidential business reports to send over the phone lines. Or maybe you've got embarrassing love letters to your sweetheart on disk. Then again, you could just be paranoid. Whatever you reason, if you have data files that you would like to maintain the privacy of, you need an encryption program.

The purpose of an encryption program is to protect your valuable data from being viewed by unauthorized persons. The encryption process makes the data appear to be a meaningless collection of random numbers. So if unwanteds get a copy of your data it is of no value to them, since it is unintelligible. But an individual who knows the encryption key can decrypt the data and restore it back to its original usefulness. *Cloak* is just such a program.

Cloak is a very easy program to use. Practically all you have to do is think of a good encryption key and answer a few simple questions. The program does the rest. *Cloak* can be run on the VIC 20 with or without memory expansion, and with changes made to only two lines as follows:

```
100 MP=828:KEY=882:BY=254:TL=13713:CS=0
186 DATA 131,054,088,135,169
```

(The *Bug Repellent* line codes following each line of the program listing on page 130 are for the C-64 only.)



"Hi there, handsome!"

The encryption process is straightforward. *Cloak* will ask for the source file name. That is the name of the disk file that you would like to protect. *Cloak* will then ask you to declare which file type that data file is. You can use *Cloak* to encrypt any sequential file. Even a BASIC program can be encrypted. Then *Cloak* asks you for the name that you would like the new encrypted file to be saved under, and which file type.

That's all there is to the encryption process. Decryption is just as easy. Simply run *Cloak* again, only this time use for the source file the name of the encrypted file. And be sure to use the exact same key that you used for the encryption. Character for character, it must be identical. When the RUN/STOP key is hit or when it is finished running, *Cloak* will automatically reset the computer. This is normal. On the C-64 you can expect *Cloak* to take approximately 13 seconds for each block processed. In other words it should take *Cloak* about 130 seconds to process a ten block file. On the VIC it's about 13 seconds per block as well.

The heart of *Cloak* is a short machine language routine that does all the actual dirty work. BASIC simply handles all the disk I/O. Since the ML routine uses the tape I/O buffer, cassette operation is not possible. Cassette would not be practical anyway, since the program both reads and writes on two different files consecutively.

The all-important item is the encryption key. It can be any group of characters that you can type into a string variable via the BASIC INPUT command. Although graphics characters are allowed in the key, you may wish to stick to simple text. It is much easier to remember a line from your favorite poem than meaningless graphics symbols.

The length of the key is somewhat important. As a general rule of thumb, the longer the key, the more secure your data will be. The maximum limit on the length of the key is 136 characters. However, in practice you are limited to the size that the BASIC INPUT buffer will allow. If you are willing to give up the INPUT command on line 112, then KY$ could be assigned a string value and by adding characters a key with a length of up to 136 characters could be built.

The encryption process used by *Cloak* is reasonably secure. The security provided should be suitable for home use as well as small businesses or clubs. □

SEE PROGRAM LISTING ON PAGE 130

TIPS AHOY!

Compiled by Michael Davila

Shawn K. Smith received $40 for his *Saved Again* routine in the November installment of *Tips Ahoy!* Don Lewis banked an equal sum for *In-Code Load,* while Mark Baker's six-line *Write Protect Tab Checker* netted him $30 (or $5 per line!). That's just a sampling—your contribution could earn you even more. But even if you make a lousy twenty bucks, you're in disks for the year! Why not send your best original tip or suggestion, pertaining to programming or any aspect of Commodore home computing, to *Tips Ahoy!*, c/o Ion International Inc., 45 West 34th Street—Suite 407, New York, NY 10001.

NO KNOCKS AND PINGS

Cleaning your 1541's heads can be hazardous to your alignment if you spin the cleaning disk with error-producing loops such as

```
OPEN1,8,15:FORX=0TO5:PRINT#1,"V":NEXT:CL
OSE1
```

In the October '85 *Ahoy!*, John DeRosa solved the problem with a utility to vary the head position, keep track of the times a cleaning disk is used, and spin the motor harmlessly by changing a bit in the 1541's memory. The following brief code, borrowed and modified from John's program, will do the job without all the bookkeeping.

```
10 PRINT"[CLR/RVS ON]DRIVE HEAD CLEANER[
22 SPACES]"
20 PRINT"**INSERT CLEANING DISK**[DWN]"
30 INPUT"SPIN DRIVE MOTOR HOW MANY SECON
DS";S:S=S*60
40 OPEN1,8,15:PRINT#1,"M-R"CHR$(00)CHR$(
28)
50 GET#1,X$:X=ASC(X$+CHR$(0))
60 BI=X OR 4
70 PRINT#1,"M-W"CHR$(00)CHR$(28)CHR$(01)
CHR$(BI):CLOSE1:REM START DRIVE MOTOR
80 J=TI
90 IFTI-J<STHEN90
100 BI=X
110 OPEN1,8,15:PRINT#1,"M-W"CHR$(00)CHR$
(28)CHR$(01)CHR$(BI):REM STOP MOTOR
120 CLOSE1:END
```

—Bert Halverson
Joplin, MO

SYS REMINDER

Trying to remember all those SYS numbers that belong to your machine language programs can be quite tedious. If a program name is ALIEN, and its SYS number is 49152, try saving the program like this:

```
SAVE"ALIEN[SS]49152",8,1
```

When you go to list the directory, you will see "ALIEN" 49152, a little reminder of the SYS number. To load the program back into the machine type LOAD"ALIEN",8,1. This method can also be used to shorten program names, for example:

```
SAVE"1[SS]ALIEN",8,1
```

Later on just LOAD"1",8,1.

—Michael Smith
Port Hawkesbury, Canada

I/O BLUES CHANNEL

When writing a program that requires opening and closing files, such as sequential and relative files, I find it useful to put a short routine at the end of my program which cannot be accessed by the program, and will check the error channel when you need it to (since when an I/O error has occurred, it will only say "SYNTAX ERROR" and not describe what is the problem). I just type RUN 20000 (20000 being the routine starting line) and presto, you can find out what is wrong.

```
20000 OPEN 15,8,15
20010 INPUT#15,A$,B$,C$,D$
20020 PRINT A$,B$,C$,D$
20030 CLOSE15
```

I would be lost without this useful routine! —Barry Allyn
Arlington, WA

RELINE A LINE

Reline is a handy little utility for the C-64 that renumbers your BASIC program lines in any increment you choose, between one and 255. Just run it and answer the prompt. Then, after loading the program you want to change, type SYS50000 and press RETURN. Instantly the lines in your program will be renumbered. Since *Reline* resides in a separate area of RAM, BASIC will not disturb it. Neither will loading and saving programs. You can SYS it as often as you like.

Reline is also handy when you're writing a program and you've had to add new lines between old. Just SYS50000, and presto, everything's renumbered. You can change the increment at any time by POKEing location two with the desired amount (i.e.: POKE2,10).

Notice that the lines in *Reline* are incremented by 10. To demonstrate how nifty and easy it is to use, answer the initial prompt with 25, then SYS50000. List *Reline* and you'll see that all the lines are now in increments of 25. POKE2,100, then SYS50000. Another listing reveals the lines now increase by 100.

Although there are some full-fledged renumbering programs (see *Renumbering Utility* by Anthony Wood, July '84) that will change any GOTO, GOSUB, and IF/THEN statements accordingly, in the interest of brevity (nine lines long = no arduous typing) I elected to omit this option. If the program you want renumbered has any of the above commands, be sure to make note, so you can change them later.

```
10 PRINT"[CLR]":FORJ=50000TO50056:READA:
POKEJ,A:X=X+A:NEXTJ
20 IFX<>7825THENPRINT"ERROR IN DATA...":
END
30 PRINT"DATA OK...":INPUT"[DOWN]DESIRED
 INCREMENT (1-255)";I:POKE2,I
40 PRINT:PRINT"[DOWN]SYS50000 TO RENUMBE
R...":END
50 DATA165,2,133,253,141,3,8,169,0,133,2
54,141
60 DATA4,8,174,1,8,173,2,8,134,251,133,2
52
70 DATA165,253,24,101,2,133,253,197,2,17
6,2,230
80 DATA254,160,2,145,251,200,165,254,145
,251,160,0
90 DATA177,251,170,200,177,251,208,220,9
6
```

—Buck Childress
Salem, OR

FILE METAMORPHOSIS

Have you ever tried loading a program file into a word processor? As you all know, the results are 'weird' to say the least. Here is a simple method of converting your program (PRG) to a sequential(SEQ) file.

Load the program you wish to convert. Enter the following directly (use a different name from the original):

```
OPEN 5,8,5,"<PRG NAME>,S,W":CMD 5:LIST
```

When the program is done (you will see the cursor), enter:

```
PRINT#5:CLOSE5
```

Remember to type out the word PRINT and not to use the '?'. If you look at the directory you will see a new SEQ file on the disk. You will now be able to load or

merge this file on a word processor with the full assurance that it will be readable.

—George E. Lang
Pittsburgh, PA

VIEW BETTER BAM

The readability of the VIEW BAM program on the 1541 TEST/DEMO disk can be greatly improved by changing the symbols used to designate the sectors. The following POKEs quickly substitute my choices. Load VIEW BAM, then POKE 3398,42:POKE 3414,46 and resave the program. This changes the full sector symbol (program line 640) to a reverse asterisk, and the empty sector symbol (program line 650) to a period.

I thought that this little routine might be useful. It accepts a character in either of two ways, as text or ASCII code. It is not necessary to specify how the character is being entered.

```
10 INPUT"TEXT CHARACTER OR ASCII";A$
20 A=ASC(A$):IF VAL("1"+A$)<>1 THEN A=VA
L(A$)
30 PRINT A,CHR$(A)
40 GOTO 10
```

—Donald E. Fulton
Stoneham, MA

STOP-LIST

This short utility redefines the SHIFT keys so that when pressed they will temporarily stop the listing of a program until you let go. The SHIFT LOCK key is also redefined, making the process of proofreading directly from the screen more pleasant of a task. To use, load and run *Stop-List*; the program will then execute and erase itself. Next load in the program you wish to view and LIST.

```
10 REM ** STOP-LIST BY DAVID ROSCOE **
20 L=232:H=PEEK(56)-1:Q=PEEK(775):IFQ<16
7THEN80
30 POKE55,L:POKE51,L:POKE56,H:POKE52,H:P
OKE774,L:POKE775,H
40 FOR X=L+H*256 TO X+21:READD:POKEX,D:N
EXT
50 POKEX,Q
60 DATA 72,152,72,32,159,255,169,1,44,14
1,2,208,246
70 DATA 169,0,133,198,104,168,104,76,26
80 NEW
```

—David Roscoe
Passaic, NJ

UNSEEN SPEED

The Commodore 64 is a good computer, but sometimes BASIC runs far too slow. The problem lies with the screen service routine. If you are doing a long series of calculations and find that the program takes too long,

why not turn off the screen display until the calculations are finished! To do this simply execute the following line from your program and the screen will go blank.

```
100 POKE 53265,PEEK(53265) AND 239
```

You will find that the program will finish at least 15% faster than normal. When the calculations are finished simply execute the following line and your screen will return to normal.

```
100 POKE 53265,PEEK(53265) OR 16
```

—Saul D. Betesh
Kingston, Ontario

SPEEDY HI-RES SCREEN CLEAR

Umpteen machine language utilities have been proposed to clear a hi-res screen, because POKEing the screen clear from BASIC is so agonizingly slow—about 30 seconds.

Here is a trick that will clear most of free memory, enough for several screens, from BASIC in 2 seconds using one easily remembered line.

```
FOR X=1 TO 255:Z$=Z$+CHR$(0):NEXT
```

Use this line before pulling down the top of BASIC. In generating one 255-byte string, this loop leaves behind in dynamic string space 254 dead strings. The total number of bytes written into is an amazing 32K, so memory from 8K to 40K is cleared in only 2 seconds.

—Donald Fulton
Stoneham, MA

FASTER BASIC?

Probably the fastest way to speed BASIC is among the least known, i.e. GET# with multiple arguments. The simple file reading program below, which reads a file with GET# 2,A$ was timed. Then line 30 was replaced with GET# A$,B$,C$,D$,E$,F$,G$,H$,I$,J$,K$,L$,M$,N$,O$,P$,Q$,R$,S$,T$,U$,V$,W$. The results are given below.

	7 Sector File	55 Sector File
Single GET#	17 Sec.	144 Sec.
Mult. GET#	6 Sec.	49 Sec.

While it takes a few seconds to type such a long line, a X3 speed improvement is well worth it!

It's faster probably because each time GET# is encountered, the input must be switched from the keyboard to a specified logical channel.

—Donald Fulton
Stoneham, MA

```
10 MM=TI
20 OPEN 2,8,2,"PROGRAM,P,R"
30 GET#2,A$
40 IF ST=0 THEN 30
50 PRINT"TIME="(TI-MM)/60
60 CLOSE2
```

DIRECTORY MANIPULATOR

For the C-64

By Bob Ossentjuk

The *Directory Manipulator (DM)* is an all-BASIC utility program for the C-64 and 1541 disk drive. *DM* provides eight directory manipulation options which are accessed by the function keys. The options available are:

f1–Relist directory
f2–Alphabetize directory
f3–Insert BLANK entry
f4–Delete BLANK entries
f5–Insert ----- entry (dashed line entry)
f6–Insert 'REMARK' entry
f7–Swap directory entries
f8–Delete directory entries

When *DM* is executed it will read and display the directory of the inserted diskette. The directory display will accommodate up to 40 entries at a time. If there are in excess of 40 entries on the diskette, you will be prompted to 'HIT ANY KEY' to display the next 40 entries.

Once the display is completed, you will be prompted with 'DIRECTORY OK'. A 'YES' response will cause you to exit the *DM* program. If no directory changes have been made, the directory will not be rewritten. If changes have been made, the directory will be rewritten. In either case the diskette will be VALIDATED upon exit. If you answered 'NO' to the 'DIRECTORY OK' prompt, you will be prompted to 'SELECT DIRECTORY MANIPULATION COMMAND'.

Selection of any of the above described function keys or 'H'elp may be made at the 'SELECT DIRECTORY MANIPULATION COMMAND' prompt.

Selecting 'H' will display the HELP menu, which provides a brief description of each of the FUNCTION KEY commands. If 'H'elp has been executed and no changes have been made to the directory, you may exit *DM* without rewriting the directory.

An f1 ('RE-LIST DIRECTORY') selection redisplays the directory. If f1 has been executed and no changes have been made to the directory, you may exit *DM* without rewriting the directory.

Use of commands f2 through f8 (described below) *will* cause the directory to be rewritten upon exit from *DM:*

Executing f2 ('ALPHABETIZE DIRECTORY') will sort the directory into alphabetical order. A SHELL SORT routine was used to perform this function (see line 900).

Selection of f3 ('INSERT BLANK ENTRY') causes a blank entry to be inserted into the directory at the location specified at the appropriate prompt. The blank entry will be replaced by the file/program entry of the next file/program saved to the diskette. This provides a method by which the order of directory entries can be controlled.

The f4 ('DELETE BLANK ENTRIES') command removes all blank entries from the directory.

Execution of the f5 ('INSERT ----- ENTRY') option causes a dashed line entry filename to be placed into the directory at the specified location. The dashed line can be used to delineate groups of files, comments, and/or remarks.

Selecting f6 ('INSERT REMARK ENTRY') causes the selected REMARK to be entered into the directory, as a filename, at the appropriate location. The f6 command provides a method to add comments to a diskette directory.

Choosing f7 ('SWAP DIRECTORY ENTRIES') allows any two selected entries to swap positions in the directory.

The f8 ('DELETE DIRECTORY ENTRY') command will delete the selected filename from the directory. Once the command is executed, there is no recovery of the deleted file possible.

The *Directory Manipulator* is designed to allow the user to freely reorganize and comment diskette directories. However, when you first enter the program it should be tested with a diskette that you can afford to destroy. The *DM* does write a new directory, and if the program is not properly debugged it could destroy your diskette directory.

DM is very modular and is heavily commented. The modularity facilitates easy program modification. For example, if you would like to leave out the HELP menu, simply remove line 610 and lines 1310-1390. The comments are provided to allow for easier understanding of the program. The REM statements may be left out when the program is entered if you wish to reduce entry time. □

SEE PROGRAM LISTING ON PAGE 127

Continued from page 63

programs! Operation with the DOS Wedge program loaded is sporadic, and at times the computer may hang up and have to be powered down.

The COMMTX program reads the keyboard with the GET statement until a key is pressed. It then sends the typed character to file number 2 and displays it on the screen. The COMMRX program simply sits, waiting for a character to arrive from file #2. Upon receiving a character with the GET#2 statement, it prints the character and goes back to wait for the next one.

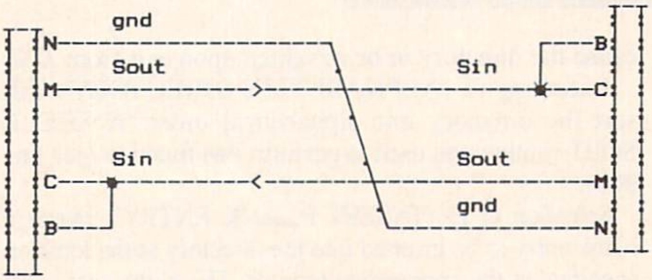


Figure 1—Connecting Two Commodore Computers in Three-Line Mode

About the only thing left to discuss is the OPEN statement that starts both of these programs. The statement

```
10 OPEN 2,2,0,CHR$(8)+CHR$(0)
```

creates a communication channel with a logical file number 2. The file number is arbitrary and may range from 1 to 255. Numbers above 127 are not recommended unless you need to send a linefeed after each carriage return. The second "2" is the device code. In this case, we are opening a port to an RS-232 device. The secondary address of 0 is used for RS-232 communications.

The two character bytes following the secondary address provide details about the serial link being opened. The first character specifies the word length, the number of stop bits, and the baud rate. The second character specifies parity, duplex mode, and handshake format. These terms are not really very difficult to understand. We will discuss them in detail.

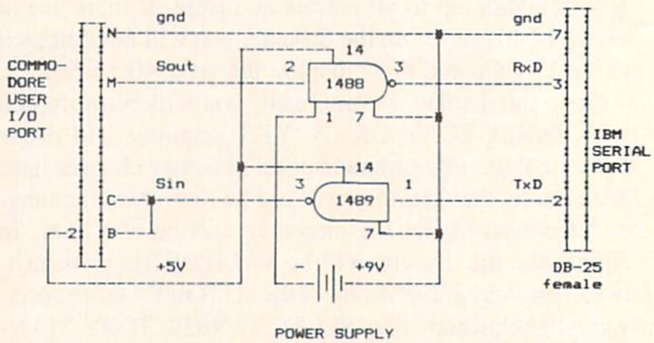
Each character transmitted on the RS-232 link is sent in serial format. There is only one wire, and it can carry only one bit of information at a time. The ASCII value for the letter "A" is 65. In hexadecimal that is 41, and in binary the letter "A" is represented as 0100 0001. All of the standard ASCII characters have decimal values less than 128. This means that each can be represented in only seven bits of data. The eighth bit in the byte will always be zero.

Consequently, in order to speed up serial communications, it is possible to define a serial word consisting of only seven bits instead of the normal eight used within the computer. If you were sending serial messages using an even more limited character set, it might be possible to get by with only a six or even a five bit code. Five bits are enough to encode the whole alphabet and have a few extras ($2^5 = 32$).

We are allowed to specify the number of bits in each character to be transmitted or received. The programs in this article specify an eight-bit word length. The argument of the first CHR$ function in the OPEN statement is the sum of three numbers representing the baud rate, the number of stop bits, and the word length. The sum is written to the control register of the serial channel. The values for specific word lengths are as follows:

Word Length	Control Register Value
8 bits	0
7 bits	32
6 bits	64
5 bits	96

The RS-232 serial transmission is asynchronous. This means that there is no clock signal between the transmitter and the receiver. In order for the two devices to communicate, each one must know how fast the stream of serial bits is sent. If the transmitter sent the code 00110011, the receiver must know the "bit-width" or the amount of time that each bit uses. If the receiver read the bits half as fast as they were sent, the receiver might conclude that the data was simply 0101. If the data is read at twice the rate that it should be, this word might be interpreted as two bytes: 00001111 00001111. The established rate of transmission and reception is called the baud rate. Both ends of the line must know the baud rate in order to communicate.



Note: Tie unused input pins (1488 pins 4,5,9,10,12,13 and 1489 pins 4,10,13) to ground to save power.

Figure 2—Connecting a Commodore Computer to an IBM-PC (RS-232)

The most common baud rates are 110, 300, 1200, 2400, 4800, 9600, and 19200 baud, but others are used as well. With our serial link, the baud rate simply means "the number of bits per second." (Purists who care about such things are quick to point out that "baud rate" for other forms of serial transmission is not as simple as "bits per second," but we will avoid such esoteria.)

The chosen baud rate value is included in the value written to the control register. Some of the values are listed in the following table:

Baud Rate	Control Register Value
110	3
300	6
600	7
1200	8
2400	10

The complete list of possible baud rates is in Figure 6-1 of the *Commodore 64 Programmer's Reference Guide.* The binary values shown in the figure must be converted to decimal as the above examples show.

Normally the line between the transmitter and the receiver sits at a logic low state. When a character is sent, it is preceded by a single logic high bit, called the "start bit." This wakes up the receiver which prepares to read in the following data bits. After the last data bit is read (as defined by the word length), at least one more bit, called the "stop bit," is received. The stop bit provides a pause before the next set of bits is received. Sometimes it is desirable to increase the gap between characters, in which case two stop bits may be specified. The values sent to the Control Register to define the number of stop bits are listed:

# of Stop Bits	Control Register Value
1	0
2	128

To communicate at 1200 baud (8) with eight data bits (0) and one stop bit (0), the value sent to the Control Registers of the transmitter and receiver must be 8 + 0 + 0. That explains the CHR$(8) in the OPEN statement. Three hundred baud with two stop bits and seven data bits would be 6 + 128 + 32, so the OPEN statements would use CHR$(166).

If you have trouble getting reliable communications at 1200 baud, try 300 or even 110 baud. Most problems occur when the receiver buffer fills up, because BASIC cannot empty it and process the data quickly enough. Reducing the baud rate and putting delay loops in the transmitter software are two ways of solving the problem. There should be no problem with COMMRX and COMMTX at 1200 baud as shown, since they are operating essentially at keyboard speeds.

The second CHR$ function in the OPEN statement is optional. The CHR$(0) indicates that we are using a 3-sire interface in full duplex mode with parity disabled. These are the default values, and the program would work the same if we omitted the CHR$(0).

The IBM-PC counterparts to COMMTX and COMMRX are IBMTX and IBMRX:

```
1 ' IBMTX - TRANSMIT TO COMMODORE
2 '  PROGRAM FOR THE IBM-PC
3 '       --- IBMTX ---
4 '
10 OPEN"COM1:1200,N,8,1,RS,CS,DS,CD" AS
#1
20 T$=INKEY$ : IF T$="" THEN 20
30 PRINT #1,T$; : PRINT T$;
40 GOTO 20
```

```
1 ' IBMRX - RECEIVE FROM COMMODORE
2 '  PROGRAM FOR THE IBM-PC
3 '       --- IBMRX ---
4 '
10 OPEN"COM1:1200,N,8,1,RS,CS,DS,CD" AS
#1
20 R$=INPUT$(1,1)
30 PRINT R$;
40 GOTO 20
```

The OPEN statement in the IBM programs specifies COM1: as teh serial port with 1200 baud, parity disabled, eight bits per character, and one stop bit, the same protocol used with the Commodore programs. The logical file number is #1. The RS, CS, DS, and CD characters are used to disable some of the other RS-232 signals in the IBM and to establish a three-wire link. The INPUT$(1,1) statement is similar to the Commodore's GET statement, except that the program waits until one character has been received from file #1. The INKEY$ statement is like the Commodore's GET statement for scanning the keyboard buffer.

Remember to use the TX program in one computer and the RX program in the other. Type RUN on the receiver before typing RUN on the transmitter. That way data from the transmitter does not go into the "bit bucket" because the receiver was not ready for it.

BIDIRECTIONAL AT LAST

The COMMHS (see page 127) and IBMHS (see below) programs show how to set up bidirectional communications between two computers with software handshaking.

```
1 ' IBMHS - HANDSHAKING BETWEEN IBM AND
C-64
2 '      PROGRAM FOR THE IBM
3 '         --- IBMHS ---
4 '
10 OPEN"COM1:1200,N,8,1,RS,CS,DS,CD" AS
#1
20 T$="THIS IS IBM CALLING COMMODORE"
30 WHILE NOT EOF(1) : J$=INPUT$(1,1) : W
END 'CLEAR BUFFER
40 N=N+1 : PRINT #1,N;T$
50 GOSUB 80     'WAIT FOR HANDSHAKE
70 GOTO 40      'SEND NEXT MESSAGE
80 R$=INPUT$(1,1) : PRINT R$; : IF R$<>C
HR$(13) THEN 80
90 RETURN
```


Line 30 in both COMMHS and IBMHS clears the receiver buffer. The IBM program in line 40 increments counter N and sends the count as well as the message T$ to the Commodore. Then it loops in line 80, displaying the return message from the Commodore. Once the IBM sees the carriage return (CHR$(13)), it continues from line 40.

The Commodore program builds a message string M$ character by character until it receives a carriage return CR$ from the IBM. The PRINT# statement, just like the PRINT statement, generates a carriage return if a comma or a semicolon is not present at the end of the line. Once the Commodore has read the carriage return, it branches to line 80 where the value of N that it just received is stripped from M$, and a new message T$ is created and sent to the IBM.

These programs are meant to show how the two computers can pass information back and forth and how the messages may be synchronized by means of software handshaking. One computer waits in a receive loop until it recognizes that the message is complete, then it becomes the transmitter while the other computer operates in the receive loop.

You should have no difficulty modifying the IBMHS program to run on a second Commodore computer. Change the OPEN and INPUT$ statements as well as line 30 as previously discussed. You might also modify the IBMHS program to do something with the data received from the Commodore rather than simply wait for the carriage return.

GRAND FINALE

After studying and modifying the earlier programs, you should be able to understand the sequence of the COMMHILO (see page 127) and IBMHILO (shown here) programs.

```
1 'IBMHILO - HI-LO GAME WITH THE C-64
2 '  PROGRAM FOR THE IBM-PC
3 '    --- IBMHILO ---
4 '
5 CLS     'CLEAR SCREEN
10 OPEN"COM1:1200,N,8,1,RS,CS,DS,CD" AS
#1
20 MX=1048576 : MN=0 'MAX AND MIN VALUES
30 N=(MX+MN)/2       'INITIAL GUESS
40 T$="PICK A NUMBER FROM"+STR$(MN)+" TO
"+STR$(MX)
50 GOSUB 1000         'START THE GAME
60 GOSUB 2000         'GET RESPONSE
70 IF R$<>"ALL RIGHT" THEN 40
75 ' ===== MAIN OPERATING LOOP =====
80 T$="IS IT"+STR$(N)+"?"
90 GOSUB 1000         'MAKE A GUESS
100 GOSUB 2000        'GET RESPONSE
110 IF LEFT$(R$,13)="THAT'S RIGHT!" THEN
 150
120 IF RIGHT$(R$,8)="TOO HIGH" THEN MX=N
```

```
130 IF RIGHT$(R$,7)="TOO LOW" THEN MN=N
140 N=(MN+MX)/2 : GOTO 80
145 ' ====== END OF GAME  ======
150 T$="THANK YOU." : GOSUB 1000
160 GOSUB 2000
170 CLOSE : END
1000 PRINT #1,T$        'SEND MESSAGE
1010 RETURN
2000 INPUT #1,R$        'GET RESPONSE
2010 PRINT R$
2020 RETURN
```

If you are using two Commodore computers, you must modify IBMHILO slightly. Line 5 should be replaced by PRINT CHR$(147) to clear the screen. Line 10 should match the OPEN statement in COMMHILO. The transmit and receive subroutines at lines 1000 and 2000 should be replaced by the corresponding subroutines in COMMHILO.

Type RUN on the Commodore, then type RUN on the IBM. Sometimes the Commodore misses the first character sent by the IBM. Lines 40 and 50 in COMMHILO check to see that the proper message is received from the IBM before beginning. If not, the Commodore requests the IBM to repeat the message by sending "WHAT?" to the IBM. If the IBM does not receive "ALL RIGHT" to confirm that the Commodore is ready, it repeats the initial message.

The Commodore has picked a value N which it displays on its own screen, but it does not tell the IBM the value. The IBM makes its initial guess in lines 80 and 90 and awaits the response in line 100. The Commodore strips the numeric part of the IBM's guess in line 90 of COMMHILO and tests it against the correct value. It creates the proper message to return to the IBM in lines 110, 120, or 130. If the guess is not correct, the Commodore returns to line 80 where the number of guesses NG is incremented.

The IBM continues calculating new guesses in line 140 until it receives the response "THAT'S RIGHT!" followed by the correct number repeated and the number of guesses required. At that point the IBM politely ends the game. The Commodore returns the coutesy, and both computers close their files and stop. Line 160 in COMMHILO simply waits until the Commodore's transmit buffer is empty before closing the file. Without it, the IBM may not receive its final message. You may replace the END statements with delay loops followed by RUN if you want the game to be played repeatedly.

These programs give examples of some of the ways two computers can communicate. It is important that the messages are typed correctly. If the IBM is waiting for "ALL RIGHT" then "OK" or "ALRIGHT" simply won't do. It is possible to modify the programs to allow more flexibility in the messages. For example lines 120 and 130 of IBMHILO look only at the last characters of the message, ignoring any others. Line 130 of COMMHILO shows how to combine string and numeric constants and variables into a string that can be transmitted.

This is a very exciting project. There is something magical about sitting back and watching the two computers talk to one another. I have connected a speech synthesizer to the IBM for the *Hi-Lo* game. The IBM takes each message as it is transmitted or received and sends it to the speech synthesizer. The Commodore's messages are spoken in one voice and the IBM's messages are spoken in a different voice. So far I have not heard any arguments between them, but I wonder what might happen if one of the computers were to be slightly less than fair?

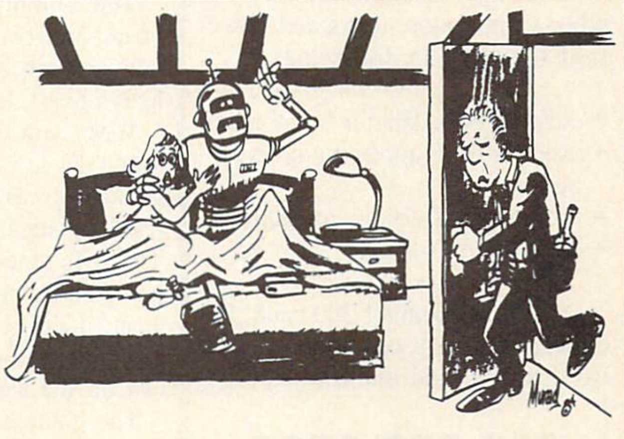
There are countless possibilities with this simple communications link between two computers. Games are only a beginning. Sharing ASCII files is certainly feasible. Now if we can get one computer to program the other one... Hmmmm. Let me know what you come up with.

Addendum: I have found that some 1488's do not operate with the five volts from the Commodore. If the IBM does not receive data properly from the Commodore you should use a second 9-volt battery instead of the five volts going to the 1488 in figure 2. Remove the five volt line from pin 14 of the 1488. The positive side of the second battery should go to pin 14 of the 1488. The negative side of the second battery should be connected to the positive side of the first battery (as well as to ground the pin 7 of the 1488 and 1489).

I was also able to eliminate the 1488 and the negative power supply by using a second gate of the 1489 instead. Try taking pin M of the Commodore connector to pin 4 of the 1489, and take pin 6 of the 1489 to pin 3 of the IBM connector. According to specifications, there is no guarantee that this will work, but it did for me. The 1489 operates properly with the Commodore's five-volt supply, reducing the circuitry to one integrated circuit, two connectors, and wire. □

SEE PROGRAM LISTINGS ON PAGE 126

Next month in the Rupert Report, *we'll continue exploring the mysteries of the RS-232 interface. Sharing programs and transferring sequential files between computers is a breeze with the software and procedures we'll develop! Plus, using the dynamic keyboard buffer to let the computer edit its own programs.*



"I lost my job today. They replaced me with a machine."

ERRATA

DISK ERROR CHECKER (Nov. '85)

Line 450 was omitted from the program, causing Error 18 to be reported. The missing line reads

```
450 GET#15,A$:A=ASC(A$+CHR
$(0)):IFA>99THEN440
```

GATORS N SNAKES (Aug. '85)

Jim Sanders, author of the program, was able to correct the bug in the machine language portion which we reported on in October. Correct line 1720 to read

```
1720 DATA 200,200,200,200,
192,16,208,239,173,1,208,2
01
```

Our apologies for any inconvenience these errors may have caused. Remember that corrections to programs and articles published in *Ahoy!* are posted on the *Ahoy! Bulletin Board* (718-383-8909 – modem required) as soon as they are spotted.

AHOY!'S BBS

If your computer is equipped with a modem, you can call *Ahoy!*'s Bulletin Board System (718-383-8909) any hour of the day, any day of the week to exchange electronic mail with other Commodore users and download files like the following:

- editorial calendars for future issues
- excerpts from upcoming news sections
- program and article corrections
- classified advertising

Set your modem for 300 baud, full duplex, no parity, one stop bit, 8-bit word length, and dial away!

718-383-8909

SANTA'S BUSY DAY

For the C-64

By George Trepal

Poor Santa is having a bad day. Instead of making presents, his elves left their work in the halls and went to a football game. Santa has to fly (you knew he could, didn't you?) through the building and collect the boxes.

The building is huge, covering more than 10 screens, and resembles a maze. The screen does a four-way scroll with Santa always remaining in the middle. Plug your joystick into port #2. A new building is made for each game, so there is no hope of memorizing the floor plan. To pick up a box Santa has to fly directly over it so that his center is the same as the box's center.

You'd expect anyone who could fly to have other abilities. Santa is able to pass a little way through walls, but if his center gets into a wall then OUCH!

Santa can't spend all day floating around the halls. The time used is shown as a green bar at the bottom of the screen. Running into a wall discourages the old man and he'll decide to spend less time with each crash.

The building contains over 200 boxes and two magic hearts. Each box is worth 10 points. If Santa collects a magic heart the timer is reset.

When you run the game you'll be asked if you want an easy or regular game. The easy game isn't really. The regular game is outrageously difficult. The difference is that in the easy game Santa stops when you tell him to and doesn't bounce if he hits a wall. Get him off walls quickly, since he can hit the same wall many times.

The game ends either when Santa's time is up or he collects 200 packages. To play again press any key.

The initial loading period is pretty long. The BASIC program has to be turned into machine language routines. Once the machine language is in place there will be no more delays.

To change from an easy to a regular game or vice versa press the RUN/STOP and RESTORE keys simultaneously. On some computers giving the RESTORE key short taps rather than pressing works best. The screen will clear. If you want a regular game type POKE 828,0 and if you want an easy game type POKE 828,1. Press RETURN, type SYS 49160, press RETURN again, and you'll be back in business.

Warning! This program uses most of the computer's memory. Your original BASIC program will be wiped out when you run it. Therefore be sure to save this program after you type it in without running it first!

If you know how to use a monitor you can save the machine language routines directly. The sprite data is stored between 896 and 960. The rest of the program lives between 49152 and 50491. In order to start the game SYS to 49160.

The BASIC loader program uses hexadecimal numbers that have to be converted to decimal numbers to be POKEd in place where they will become hexadecimal numbers again. Whew! The usual way to do such things is to read decimal numbers separated by commas out of data statements. My system uses no commas, has a standardized two digit number, and is 45% shorter than decimalized data would be. It's the shortness that counts when you're typing. □

SEE PROGRAM LISTING ON PAGE 144

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the VIC 20 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. ☐

Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type	You Will See
[CLEAR]	Screen Clear	SHIFT CLR/HOME	
[HOME]	Home	CLR/HOME	
[UP]	Cursor Up	SHIFT ↑CRSR↓	
[DOWN]	Cursor Down	↑CRSR↓	
[LEFT]	Cursor Left	SHIFT ←CRSR→	
[RIGHT]	Cursor Right	←CRSR→	
[SS]	Shifted Space	SHIFT Space	
[INSERT]	Insert	SHIFT INST/DEL	
[DEL]	Delete	INST/DEL	
[RVSON]	Reverse On	CNTRL 9	
[RVSOFF]	Reverse Off	CNTRL 0	
[UPARROW]	Up Arrow	↑	
[BACKARROW]	Back Arrow	←	
[PI]	PI	π	
[EP]	English Pound	£	

When You See	It Means	You Type	You Will See
[BLACK]	Black	CNTRL 1	
[WHITE]	White	CNTRL 2	
[RED]	Red	CNTRL 3	
[CYAN]	Cyan	CNTRL 4	
[PURPLE]	Purple	CNTRL 5	
[GREEN]	Green	CNTRL 6	
[BLUE]	Blue	CNTRL 7	
[YELLOW]	Yellow	CNTRL 8	
[F1]	Function 1	F1	
[F2]	Function 2	SHIFT F1	
[F3]	Function 3	F3	
[F4]	Function 4	SHIFT F3	
[F5]	Function 5	F5	
[F6]	Function 6	SHIFT F5	
[F7]	Function 7	F7	
[F8]	Function 8	SHIFT F7	

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** This and the preceding explain these codes and provide other essential information on entering **Ahoy!** programs. Read these pages **before** entering programs.

BUG REPELLENT

This program will let you debug any *Ahoy!* program. Follow instructions for VIC 20 (cassette or disk) or C-64.

VIC 20 VERSION

By Michael Kleinert and David Barron

For cassette: type in and save the *Bug Repellent* program, then type RUN 63000[RETURN]SYS 828[RETURN]. If you typed the program properly, it will generate a set of two-letter line codes that will match those listed to the right of the respective program lines.

Once you've got a working *Bug Repellent*, type in the program you wish to check. Save it and type the RUN and SYS commands listed above once again, then compare the line codes generated to those listed in the magazine. If you spot a discrepancy, a typing error exists in that line. Important: you must use exactly the same spacing as the program in the magazine. Due to memory limitations on the VIC, the VIC *Bug Repellent* will register an error if your spacing varies from what's printed.

You may type SYS 828 as many times as you wish, but if you use the cassette for anything, type RUN 63000 to restore the *Repellent*.

When your program has been disinfected you may delete all lines from 63000 on. (Be sure the program you type doesn't include lines above 63000!)

For disk: enter *Bug Repellent*, save it, and type RUN:NEW [RETURN]. Type in the program you wish to check, then SYS 828.

To pause the line codes listing, press SHIFT.

To send the list to the printer type OPEN 4,4:CMD 4:SYS 828[RETURN]. When the cursor comes back, type PRINT#4:CLOSE 4[RETURN].

```
•63000 FORX=828TO1023:READY:POKEX,Y:NEXT:END   AC
•63001 DATA169,0,133,63,133,64,165,43,133,251  JL
•63002 DATA165,44,133,252,160,0,132,254,32,228 DF
•63003 DATA3,234,177,251,208,3,76,208,3,230    OE
•63004 DATA251,208,2,230,252,169,244,160,3,32  OH
•63005 DATA30,203,160,0,177,251,170,230,251,20
8                                              KO
•63006 DATA2,230,252,177,251,32,205,221,169,58 JJ
•63007 DATA32,210,255,169,0,133,253,230,254,32 OK
•63008 DATA228,3,234,165,253,160,0,170,177,251 LG
•63009 DATA201,32,240,6,138,113,251,69,254,170 BP
•63010 DATA138,133,253,177,251,208,226,165,253
,41                                            DD
•63011 DATA240,74,74,74,74,24,105,65,32,210    EK
•63012 DATA255,165,253,41,15,24,105,65,32,210  FO
•63013 DATA255,169,13,32,210,255,173,141,2,41  PK
•63014 DATA1,208,249,230,63,208,2,230,64,230   CB
•63015 DATA251,208,2,230,252,76,74,3,169,236   KH
•63016 DATA160,3,32,30,203,166,63,165,64,32    DP
•63017 DATA205,221,169,13,32,210,255,96,230,25
1                                              EL
•63018 DATA208,2,230,252,96,0,76,73,78,69      OI
•63019 DATA83,58,32,0,76,73,78,69,32,35        FG
•63020 DATA32,0,0,0,0,0                        LE
```

C-64 VERSION

By Michael Kleinert and David Barron

Type in, SAVE, and RUN the *Bug Repellent*. Type NEW, then type in or LOAD the *Ahoy!* program you wish to check. When that's done, SAVE your program (don't RUN it!) and type SYS 49152 [RETURN].

To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to the codes listed to the right of the respective program lines. If you spot a difference, an error exists in that line. Jot down the number of lines where contradictions occur, LIST each line, spot the errors, and correct them.

```
•5000 FORX=49152TO49488:READY:POKEX,Y:NEXT:END GJ
•5001 DATA32,161,192,165,43,133,251,165,44,133 DL
•5002 DATA252,160,0,132,254,32,37,193,234,177  DE
•5003 DATA251,208,3,76,138,192,230,251,208,2   OF
•5004 DATA230,252,76,43,192,76,73,78,69,32     KN
•5005 DATA35,32,0,169,35,160,192,32,30,171     CA
•5006 DATA160,0,177,251,170,230,251,208,2,230  CE
•5007 DATA252,177,251,32,205,189,169,58,32,210 JE
•5008 DATA255,169,0,133,253,230,254,32,37,193  CL
•5009 DATA234,165,253,160,0,76,13,193,133,253  NB
•5010 DATA177,251,208,237,165,253,41,240,74,74 MB
•5011 DATA74,74,24,105,65,32,210,255,165,253   EP
•5012 DATA41,15,24,105,65,32,210,255,169,13    GH
•5013 DATA32,220,192,230,63,208,2,230,64,230   AN
•5014 DATA251,208,2,230,252,76,11,192,169,153  NG
•5015 DATA160,192,32,30,171,166,63,165,64,76   BF
•5016 DATA231,192,96,76,73,78,69,83,58,32      EP
•5017 DATA0,169,247,160,192,32,30,171,169,3    PJ
•5018 DATA133,254,32,228,255,201,83,240,6,201  FK
•5019 DATA80,208,245,230,254,32,210,255,169,4  FL
•5020 DATA166,254,160,255,32,186,255,169,0,133 CL
•5021 DATA63,133,64,133,2,32,189,255,32,192    GC
•5022 DATA255,166,254,32,201,255,76,73,193,96  NN
•5023 DATA32,210,255,173,141,2,41,1,208,249    NH
•5024 DATA96,32,205,189,169,13,32,210,255,32   IM
•5025 DATA204,255,169,4,76,195,255,147,83,67   KC
•5026 DATA82,69,69,78,32,79,82,32,80,82        DC
•5027 DATA73,78,84,69,82,32,63,32,0,76         ML
•5028 DATA44,193,234,177,251,201,32,240,6,138  GN
•5029 DATA113,251,69,254,170,138,76,88,192,0   JK
•5030 DATA0,0,0,230,251,208,2,230,252,96       NA
•5031 DATA170,177,251,201,34,208,6,165,2,73    DM
•5032 DATA255,133,2,165,2,208,218,177,251,201  JA
•5033 DATA32,208,212,198,254,76,29,193,0,169   FM
•5034 DATA13,76,210,255,0,0,0                  PA
```

FLANKSPEED FOR THE C-64

By Gordon F. Wheat

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1—SAVEs what you have entered so far.

f3—LOADs in a program worked on previously.

f5—To continue on a line you stopped on after LOADing in the previously saved work.

f7—Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. f7 temporarily freezes the output as well.

```
•5 POKE53280,12:POKE53281,11                   LL
•6 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[
15" "]";                                       ED
•10 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY P
ROGRAM[6" "]"                                  MC
•15 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[
9" "]"                                         DM
•20 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNA
```

```
TIONAL INC.[3" "]"                                DH
•30 FORA=54272TO54296:POKEA,0:NEXT                 IM
•40 POKE54272,4:POKE54273,48:POKE54277,0:POKE5
4278,249:POKE54296,15                              NH
•70 FORA=680TO699:READB:POKEA,B:NEXT               KO
•75 DATA169,251,166,253,164,254,32,216,255,96      HJ
•76 DATA169,0,166,251,164,252,32,213,255,96        JB
•80 B$="STARTING ADDRESS IN HEX":GOSUB2010:AD=
B:SR=B                                             HC
•85 GOSUB2520:IFB=0THEN80                          FO
•86 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16      KE
•90 B$="ENDING ADDRESS IN HEX":GOSUB2010:EN=B      IF
•95 GOSUB2510:IFB=0THEN80                          FP
•96 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16          MN
•97 IFB>255THENB=B-255:POKE254,PEEK(254)+1         GE
•98 POKE253,B:PRINT                                HN
•100 REM  GET HEX LINE                             IL
•110 GOSUB3010:PRINT": [c P][LEFT]";:FORA=0TO8     FG
•120 FORB=0TO1:GOTO210                             MD
•125 NEXTB                                         ME
•130 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN310         LH
•135 PRINT" [c P][LEFT]";                          IK
•140 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "         PD
•150 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255        LK
•160 NEXT                                          IA
•170 IFA%(8)<>TTHENGOSUB1010:GOTO110               FK
•180 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOT
O110                                               MN
•200 REM    GET HEX INPUT                          AB
•210 GETA$:IFA$=""THEN210                          HO
•211 IFA$=CHR$(20)THEN270                          GC
•212 IFA$=CHR$(133)THEN4000                        MD
•213 IFA$=CHR$(134)THEN4100                        KF
•214 IFA$=CHR$(135)THENPRINT" ":GOTO4500           GE
•215 IFA$=CHR$(136)THENPRINT" ":GOTO4700           BJ
•220 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO
250                                                GM
•230 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO
250                                                LE
•240 GOSUB1100:GOTO210                             LL
•250 PRINTA$"[c P][LEFT]";                         OA
•260 GOTO125                                       CG
•270 IFA>0THEN280                                  OP
•272 A=-1:IFB=1THEN290                             OB
•274 GOTO140                                       CJ
•280 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1        HG
•285 A=A-1                                         BE
•290 PRINTCHR$(20);:GOTO140                        KH
•300 REM LAST LINE                                 AD
•310 PRINT" ":T=AD-(INT(AD/256)*256)               GJ
•320 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255      PL
•330 NEXT                                          IA
•340 IFA%(A)<>TTHENGOSUB1010:GOTO110               KF
•350 FORB=0TOA-1:POKEAD+B,A%(B):NEXT               HN
•360 PRINT:PRINT"YOU ARE FINISHED!":GOTO4000       ON
•1000 REM BELL AND ERROR MESSAGES                  FL
•1010 PRINT:PRINT"LINE ENTERED INCORRECTLY":PR
INT:GOTO1100                                       DH
•1020 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":
GOTO1100                                           JA
•1030 PRINT:PRINT"ENDING IS LESS THAN STARTING
!":B=0:GOTO1100                                    HD
•1040 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED
 RANGE!":B=0:GOTO1100                              AG
•1050 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:G
OTO1100                                            KN
•1060 PRINT"?ERROR IN SAVE":GOTO1100               EI
•1070 PRINT"?ERROR IN LOAD":GOTO1100               GL
•1080 PRINT:PRINT:PRINT"END OF ML AREA":PRINT      PG
•1100 POKE54276,17:POKE54276,16:RETURN             BH
•1200 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA
$:RETURN                                           IM
•2000 REM GET FOUR DIGIT HEX                       PC
•2010 PRINT:PRINTB$;:INPUTT$                       GM
•2020 IFLEN(T$)<>4THENGOSUB1020:GOTO2010           II
•2040 FORA=1TO4:A$=MID$(T$,A,1):GOSUB2060:IFT(
A)=16THENGOSUB1020:GOTO2010                        AD
•2050 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+
T(4):RETURN                                        GF
•2060 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RET
URN                                                EH
•2070 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RET
URN                                                KP
•2080 T(A)=16:RETURN                               NP
•2500 REM ADRESS CHECK                             LI
•2510 IFAD>ENTHEN1030                              MI
•2515 IFB<SRORB>ENTHEN1040                         MG
•2520 IFB<256OR(B>40960ANDB<49152)ORB>53247THE
N1050                                              MI
•2530 RETURN                                       IM
•3000 REM ADDRESS TO HEX                           EB
•3010 AC=AD:A=4096:GOSUB3070                       HG
•3020 A=256:GOSUB3070                              CE
•3030 A=16:GOSUB3070                               PN
•3040 A=1:GOSUB3070                                MJ
•3060 RETURN                                       IM
•3070 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO3
090                                                CJ
•3080 A$=CHR$(T+48)                                JP
•3090 PRINTA$;:AC=AC-A*T:RETURN                    AC
•4000 A$="**SAVE**":GOSUB4200                      AI
•4050 OPEN1,T,1,A$:SYS680:CLOSE1                   LH
•4060 IFST=0THENEND                                EO
•4070 GOSUB1060:IFT=8THENGOSUB1200                 FJ
•4080 GOTO4000                                     FF
•4100 A$="**LOAD**":GOSUB4200                      AB
•4150 OPEN1,T,0,A$:SYS690:CLOSE1                   MF
•4160 IFST=64THEN110                               JH
•4170 GOSUB1070:IFT=8THENGOSUB1200                 CM
•4180 GOTO4100                                     FO
•4200 PRINT" ":PRINTTAB(14)A$                      FG
•4210 PRINT:A$="":INPUT"FILENAME";A$               OM
•4215 IFA$=""THEN4210                              GF
•4220 PRINT:PRINT"TAPE OR DISK?":PRINT             DF
•4230 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RE
TURN                                               IG
•4240 IFB$<>"T"THEN4230                            FN
•4250 RETURN                                       IM
•4500 B$="CONTINUE FROM ADDRESS":GOSUB2010:AD=
B                                                  DK
•4510 GOSUB2515:IFB=0THEN4500                      MA
•4520 PRINT:GOTO110                                OI
•4700 B$="BEGIN SCAN AT ADDRESS":GOSUB2010:AD=
B                                                  FH
•4705 GOSUB2515:IFB=0THEN4700                      NK
•4706 PRINT:GOTO4740                               DI
•4710 FORB=0TO7:AC=PEEK(AD+B):GOSUB3030:IFAD+B
=ENTHENAD=SR:GOSUB1080:GOTO110                     BK
•4715 PRINT" ";:NEXTB                              EC
•4720 PRINT:AD=AD+8                                GN
•4730 GETB$:IFB$=CHR$(136)THEN110                  MN
•4740 GOSUB3010:PRINT": ";:GOTO4710                JD
```

To type in BLACKBOARD.S... the use of an assembler is required. Refer to *Commodore Roots: Getting Graphic* beginning on page 91 for instructions.

BLACKBOARD.S
FROM PAGE 91

```
*
* BLACKBOARD
*
          ORG    $8000
*
COLOR     EQU    $10
BASE      EQU    $2000
SCROLY    EQU    $D011
VMCSB     EQU    $D018
COLMAP    EQU    $0400
*
HMAX      EQU    320
VMAX      EQU    200
HMID      EQU    160
VMID      EQU    100
*
SCRLEN    EQU    8000
MAPLEN    EQU    1000
*
TEMPA     EQU    $FB
TEMPB     EQU    TEMPA+2
*
TABPTR    EQU    TEMPA
TABSIZ    EQU    $9000
*
HPSN      EQU    TABSIZ+2
VPSN      EQU    HPSN+2
CHAR      EQU    VPSN+1
ROW       EQU    CHAR+1
LINE      EQU    ROW+1
BYTE      EQU    LINE+1
BITT      EQU    BYTE+2
*
MPRL      EQU    BITT+1
MPRH      EQU    MPRL+1
MPDL      EQU    MPRH+1
MPDH      EQU    MPDL+1
PRODL     EQU    MPDH+1
PRODH     EQU    PRODL+1
*
FILVAL    EQU    PRODH+1
JSV       EQU    FILVAL+1
*
CIAPRA    EQU    $DC00
*
          JMP    START
*
* BLOCK FILL ROUTINE
*
BLKFIL    LDA    FILVAL
          LDX    TABSIZ+1
          BEQ    PARTPG
          LDY    #0
FULLPG    STA    (TABPTR),Y
          INY
          BNE    FULLPG
          INC    TABPTR+1
          DEX
          BNE    FULLPG
PARTPG    LDX    TABSIZ
          BEQ    FINI
          LDY    #0
PARTLP    STA    (TABPTR),Y
          INY
          DEX
          BNE    PARTLP
FINI      RTS
*
* 16-BIT MULTIPLICATION ROUTINE
*
MULT16    LDA    #0
          STA    PRODL
          STA    PRODH
          LDX    #17
          CLC
MULT      ROR    PRODH
          ROR    PRODL
          ROR    MPRH
          ROR    MPRL
          BCC    CTDOWN
          CLC
          LDA    MPDL
          ADC    PRODL
          STA    PRODL
          LDA    MPDH
          ADC    PRODH
          STA    PRODH
CTDOWN    DEX
          BNE    MULT
          RTS
*
* PLOT ROUTINE
*
* ROW=VPSN/8 (8-BIT DIVIDE)
*
PLOT      LDA    VPSN
          LSR    A
          LSR    A
          LSR    A
          STA    ROW
*
* CHAR=HPSN/8 (16-BIT DIVIDE)
*
          LDA    HPSN
```

```
         STA   TEMPA
         LDA   HPSN+1
         STA   TEMPA+1
         LDX   #3
DLOOP    LSR   TEMPA+1
         ROR   TEMPA
         DEX
         BNE   DLOOP
         LDA   TEMPA
         STA   CHAR
*
* LINE=VPSN AND 7
*
         LDA   VPSN
         AND   #7
         STA   LINE
*
* BITT=7-(HPSN AND 7)
*
         LDA   HPSN
         AND   #7
         STA   BITT
         SEC
         LDA   #7
         SBC   BITT
         STA   BITT
*
* BYTE=BASE+ROW*HMAX+8*CHAR+LINE
*
* FIRST MULTIPLY ROW * HMAX
*
         LDA   ROW
         STA   MPRL
         LDA   #0
         STA   MPRH
         LDA   #<HMAX
         STA   MPDL
         LDA   #>HMAX
         STA   MPDH
         JSR   MULT16
         LDA   MPRL
         STA   TEMPA
         LDA   MPRL+1
         STA   TEMPA+1
*
* ADD PRODUCT TO BASE
*
         CLC
         LDA   #<BASE
         ADC   TEMPA
         STA   TEMPA
         LDA   #>BASE
         ADC   TEMPA+1
         STA   TEMPA+1
*
* MULTIPLY 8 * CHAR
*
         LDA   #8
         STA   MPRL
         LDA   #0
         STA   MPRH
         LDA   CHAR
         STA   MPDL
         LDA   #0
         STA   MPDH
         JSR   MULT16
         LDA   MPRL
         STA   TEMPB
         LDA   MPRH
         STA   TEMPB+1
*
* ADD LINE
*
         CLC
         LDA   TEMPB
         ADC   LINE
         STA   TEMPB
         LDA   TEMPB+1
         ADC   #0
         STA   TEMPB+1
*
* TEMPA + TEMPB = BYTE
*
         CLC
         LDA   TEMPA
         ADC   TEMPB
         STA   TEMPB
         LDA   TEMPA+1
         ADC   TEMPB+1
         STA   TEMPB+1
*
* POKE BYTE,PEEK(BYTE)OR2^BIT
*
         LDX   BITT
         INX
         LDA   #0
         SEC
SQUARE   ROL
         DEX
         BNE   SQUARE
         LDY   #0
         ORA   (TEMPB),Y
         STA   (TEMPB),Y
         RTS
*
* MAIN ROUTINE STARTS HERE
*
* FIRST DEFINE BIT MAP AND ENABLE
* HIGH-RESOLUTION GRAPHICS
*
START    LDA   #$18
         STA   VMCSB
*
         LDA   SCROLY
         ORA   #32
         STA   SCROLY
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 119 and 120 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
221 *
222 * SELECT GRAPHICS BANK 1
223 *
224          LDA   $DD02
225          ORA   #$03
226          STA   $DD02
227 *
228          LDA   $DD00
229          ORA   #$03
230          STA   $DD00
231 *
232 * CLEAR BIT MAP
233 *
234          LDA   #0
235          STA   FILVAL
236          LDA   #<BASE
237          STA   TABPTR
238          LDA   #>BASE
239          STA   TABPTR+1
240          LDA   #<SCRLEN
241          STA   TABSIZ
242          LDA   #>SCRLEN
243          STA   TABSIZ+1
244          JSR   BLKFIL
245 *
246 * SET BKG AND LINE COLORS
247 *
248          LDA   #COLOR
249          STA   FILVAL
250          LDA   #<COLMAP
251          STA   TABPTR
252          LDA   #>COLMAP
253          STA   TABPTR+1
254          LDA   #<MAPLEN
255          STA   TABSIZ
256          LDA   #>MAPLEN
257          STA   TABSIZ+1
258          JSR   BLKFIL
259 *
260 * DRAW HORIZONTAL LINE
261 *
262          LDA   #VMID
263          STA   VPSN
264          LDA   #0
265          STA   HPSN
266          STA   HPSN+1
267 AGIN     JSR   PLOT
268          INC   HPSN
269          BNE   NEXT
270          INC   HPSN+1
271 NEXT     LDA   HPSN+1
272          CMP   #>HMAX
273          BCC   AGIN
274          LDA   HPSN
275          CMP   #<HMAX
276          BCC   AGIN
277 *
278 * DRAW VERTICAL LINE
279 *
280          LDA   #0
281          STA   VPSN
282 POINT    LDA   #<HMID
283          STA   HPSN
284          LDA   #>HMID
285          STA   HPSN+1
286          JSR   PLOT
287          INC   HPSN
288          BNE   SKIP
289          INC   HPSN+1
290 SKIP     JSR   PLOT
291          LDX   VPSN
292          INX
293          STX   VPSN
294          CPX   #VMAX
295          BCC   POINT
296 INF      JMP   INF
```

JEWEL QUEST

FROM PAGE 17

```
·10 REM ***JEWEL QUEST*** BY BOB BLACKMER  FN
·20 PRINTCHR$(147)                          FG
·30 POKE52,48:POKE56,48:CLR                 HJ
·40 DEF FNRX(X)=INT(X/256)                  PL
·50 DEF FNTX(Z)=X-SX*256                    EA
·60 GOSUB680:GOSUB590:GOSUB1590             AJ
·70 POKE56334,PEEK(56334)AND254:POKE1,PEE
K(1)AND251                                  BE
·80 FORI=0TO63:FORJ=0TO7                    JB
·90 POKE14336+I*8+J,PEEK(53248+I*8+J):NEX
TJ,I                                        AB
·100 POKE1,PEEK(1)OR4:POKE56334,PEEK(5633
4)OR1                                       IE
·110 PRINT"[YELLOW][3"[DOWN]"][3"[RIGHT]"
]BY THE WAY, GOOD LUCK!"                    HF
·120 POKE53272,(PEEK(53272)AND240)+14:POK
E53270,PEEK(53270)OR16                      HD
·130 CK=0:FORCH=59TO62:FORBY=0TO7:READN:C
K=CK+N                                      OG
·140 POKE14336+(8*CH)+BY,N:NEXTBY,CH:IFCK
<>3205THENPRINT"ERROR-LINES 1160-1190":E
ND                                          MP
·150 GOSUB710                               CE
·160 POKE53281,0:POKE53280,0:POKE53282,2:
POKE53283,5:PRINT"[c 3]":PRINT"[CLEAR][H
OME]"                                       OC
·170 FORL=1TO4:PRINT:NEXT:PRINT"[5" "]<[8
"="]>[10" "]<[8"="]>"                       DD
·180 FORL=1TO5:PRINT:NEXT:PRINT"[10" "]<[
18"="]>"                                    GE
·190 FORL=1TO5:PRINT:NEXT:PRINT"[5" "]<[8
```

```
"="]>[10" "]<[8"="]>"                     EM
·200 FORL=1TO4:PRINT:NEXT:PRINT"[18" "]<=
=>[DOWN]"                                 HI
·210 PRINT"<[3"="]>[GREEN] ENERGY 99[c 3]
<[8"="]>[GREEN] LEVEL[3" "][c 3]<[4"="][
HOME]":POKE2023,62                        AD
·220 Y1=170:X=176:POKEV+2,JX(1):POKEV+3,J
Y(1):POKE2041,198:P=193:J=1:LV=1          CA
·230 C=54272:F=49241:POKE700,0:POKE701,39
:POKE702,57:POKE703,58:POKE704,0          MI
·240 POKE2016,LV+48:POKE2016+C,5:POKEV+1,
Y1:POKEV+21,2:POKE1997,57:POKE1998,57     EG
·250 PRINT"[HOME][GREEN]"TAB(7)"PRESS FIR
E BUTTON TO START":POKEV+21,3             AN
·260 FR=PEEK(56320)AND16:IFFR=16THEN250   DJ
·270 PRINT"[HOME]"TAB(7)"[26" "]":SYS4943
7:POKEV+30,0                              OP
·280 SYS49152:IFPEEK(679)THENX=X+4:POKE67
9,0:P=193                                 DA
·290 IFPEEK(680)THENX=X-4:POKE680,0:P=197 AG
·300 IF(X<25)OR(X>340)THENX=25            AK
·310 IF(PEEK(V+1)<50)OR(PEEK(V+1)>240)THE
NPOKEV+1,50                               LO
·320 POKE2040,P:SX=FNRX(X):LX=FNTX(Z):POK
EV,LX:POKEV+16,SX:IFLV>7THENSYSF          NN
·330 IFPEEK(V+31)<>2THENSYS49348:IFPEEK(7
04)THEN370                                PL
·340 IFPEEK(V+30)=3THENGOSUB450           LO
·350 GETAN$:IFAN$="[F1]"THENGOSUB500      BC
·360 GOTO280                              CG
·370 POKE198,0:POKE1998,48:PRINT"[HOME][6
"[DOWN]"]"TAB(15)"[GREEN]GAME OVER"       NI
·380 PRINTTAB(14)"PLAY AGAIN?":PRINTTAB(1
7)"(Y/N)"                                 JH
·390 WAIT198,1:GETAN$                     BM
·400 IFAN$="Y"THENGOTO430                 HE
·410 IFAN$="N"THENPOKE828,0:SYS828        FB
·420 GOTO390                              CE
·430 PRINT"[HOME][6"[DOWN]"]"TAB(15)"[9"
"]":POKEV+21,0                            EC
·440 PRINTTAB(14)"[11" "]":PRINTTAB(17)"[
5" "]":GOTO220                            OF
·450 SYSF:POKES+1,9:POKES+4,17:J=J+1:IFJ=
11THENJ=1:GOSUB480                        PN
·460 POKEV+21,1:POKEV+2,JX(J):POKEV+3,JY(
J):POKEV+21,3:POKEV+30,0                  JO
·470 FORL=1TO10:NEXT:POKES+4,129:RETURN   EE
·480 LV=LV+1:IFLV>9THEN530                GD
·490 POKE2016,LV+48:RETURN                AO
·500 PRINT"[HOME][RED]"TAB(7)"RELAX-PRESS
 [GREEN]F3[RED] TO CONTINUE"              FP
·510 POKE198,0:WAIT198,1:GETP$:IFP$<>"[F3
]"THEN510                                 IH
·520 PRINT"[HOME]"TAB(7)"[32" "]":SYS4943
7:RETURN                                  MH
·530 POKES+4,17:FORK=1TO10                EL
·540 PRINT"[HOME][7"[DOWN]"][4"[RIGHT]"][
GREEN]C O N G R A T U L A T I O N S ! !" EH
·550 FORL=200TO20STEP-10:SYSF:POKES+1,L:N
EXTL:POKES+4,33                           PH
·560 PRINT"[HOME][7"[DOWN]"][4"[RIGHT]"][
RED]C O N G R A T U L A T I O N S ! !":F
ORL=150TO170:POKES+1,L                    AA
·570 SYSF:NEXT:NEXTK:POKES+4,0:PRINT"[DOW
N][7"[RIGHT]"][GREEN]PRESS ANY KEY TO PL
AY AGAIN"                                 LP
·580 POKE198,0:WAIT198,1:GOTO160          PC
·590 V=53248:S=54272:CK=0:FORL=12288TO123
50:READA:CK=CK+A:POKEL,A:NEXT             JN
·600 FORL=12352TO12414:READA:CK=CK+A:POKE
L,A:NEXT                                  HC
·610 FORL=12544TO12606:READA:CK=CK+A:POKE
L,A:NEXT                                  GC
·620 FORL=12608TO12670:READA:CK=CK+A:POKE
L,A:NEXT                                  LC
·630 FORL=12672TO12734:READA:CK=CK+A:POKE
L,A:NEXT                                  CG
·640 IFCK<>13468THENPRINT"ERROR IN LINES
760-1150":END                             IK
·650 POKEV+28,3:POKEV+37,15:POKEV+38,7:PO
KEV+39,12:POKEV+40,1                      CA
·660 FORL=STOS+24:POKEL,0:NEXT:POKES+1,20
0:POKES+5,16:POKES+6,64                   OB
·670 POKES+18,129:POKES+14,5:POKES+24,15:
RETURN                                    EG
·680 CK=0:FORL=1TO10:READJX(L),JY(L):CK=C
K+JX(L)+JY(L):NEXT                        BM
·690 IFCK<>3286THENPRINT"ERROR IN LINES 7
40-750":END                               PF
·700 RETURN                               IM
·710 ML=49152:CK=0:FORL=MLTOML+309:READA:
POKEL,A:CK=CK+A:NEXT                      AN
·720 IFCK<>37116THENPRINT"ERROR IN LINES
1200-1580":END                            EN
·730 RETURN                               IM
·740 DATA 92,88,255,88,175,136,92,185,255
,185,175,224,113,136,234,136              FI
·750 DATA 113,185,234,185                 IO
·760 DATA 34,34,32,162,162,34,170,170     CK
·770 DATA 186,8,32,32,0,128,0,2           JF
·780 DATA 20,0,8,40,0,32,40,0             NJ
·790 DATA 128,80,0,32,80,0,8,80           DL
·800 DATA 0,0,112,0,2,84,0,0              EM
·810 DATA 85,0,0,169,64,0,33,64           FG
·820 DATA 0,137,64,2,2,120,8,0            KH
·830 DATA 156,32,0,32,168,0,42            KK
·840 DATA 34,34,32,136,136,136,34,32      PH
·850 DATA 32,0,32,0,0,128,0,2             NJ
·860 DATA 20,0,8,40,0,32,40,0             NJ
·870 DATA 128,80,0,32,80,0,8,80           DL
·880 DATA 0,0,112,0,2,84,0,0              EM
·890 DATA 85,0,0,169,64,0,33,64           FG
·900 DATA 0,137,64,2,2,120,8,0            KH
·910 DATA 156,32,0,32,168,0,42            KK
·920 DATA 34,34,32,162,162,34,170,170     CK
·930 DATA 186,8,32,32,0,8,0,1             HA
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 119 and 120 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
•940 DATA 66,0,0,160,128,0,160,32        NE
•950 DATA 0,80,8,0,80,32,0,80            KP
•960 DATA 128,0,112,0,1,82,0,5           BE
•970 DATA 80,0,20,168,0,20,32,0          FP
•980 DATA 20,136,0,242,2,0,232,0         JF
•990 DATA 128,32,0,32,168,0,42           MF
•1000 DATA 8,136,136,162,34,34,72,136    OG
•1010 DATA 138,0,32,0,0,8,0,1            NK
•1020 DATA 66,0,0,160,128,0,160,32       NE
•1030 DATA 0,80,8,0,80,32,0,80           KP
•1040 DATA 128,0,112,0,1,82,0,5          BE
•1050 DATA 80,0,20,168,0,20,32,0         FP
•1060 DATA 20,136,0,242,2,0,232,0        JF
•1070 DATA 128,32,0,32,168,0,42          MF
•1080 DATA 0,32,0,0,184,0,2,254          EK
•1090 DATA 0,0,184,0,0,32,0,0            AM
•1100 DATA 0,0,0,0,0,0,0,0               FG
•1110 DATA 0,0,0,0,0,0,0,0               FG
•1120 DATA 0,0,0,0,0,0,0,0               FG
•1130 DATA 0,0,0,0,0,0,0,0               FG
•1140 DATA 0,0,0,0,0,0,0,0               FG
•1150 DATA 0,0,0,0,0,0,0                 PD
•1160 DATA 40,20,150,85,150,150,20,40    FB
•1170 DATA 2,10,42,170,85,85,85,85       DB
•1180 DATA 170,170,170,170,85,85,85,85   AG
•1190 DATA 170,169,165,149,85,84,80,64   CN
•1200 DATA 169,129,141,4,212,173,0,220   LM
•1210 DATA 41,8,208,10,169,1,141,167     GM
•1220 DATA 2,169,192,141,248,7,173,0     FD
•1230 DATA 220,41,4,208,10,169,1,141     CM
•1240 DATA 168,2,169,196,141,248,7,173   LF
•1250 DATA 0,220,41,16,208,9,206,1       MG
•1260 DATA 208,206,1,208,76,58,192,238   OE
•1270 DATA 1,208,169,0,141,0,220,173     LP
•1280 DATA 27,212,141,40,208,174,248,7   JN
•1290 DATA 224,194,16,8,169,192,141,248  CO
°1300 DATA 7,76,89,192,169,196,141,248   LD
•1310 DATA 7,169,59,174,188,2,172,189    MG
•1320 DATA 2,238,188,2,206,189,2,157     GG
•1330 DATA 0,4,157,224,5,153,240,4       ON
•1340 DATA 153,32,7,169,32,157,0,4       FJ
•1350 DATA 157,224,5,153,240,4,153,32    BL
•1360 DATA 7,174,188,2,172,189,2,169     LF
•1370 DATA 59,157,0,4,157,224,5,153      PH
•1380 DATA 240,4,153,32,7,162,180,202    KD
•1390 DATA 142,1,212,224,0,208,248,173   FO
•1400 DATA 189,2,201,0,208,29,169,32     DM
•1410 DATA 141,39,4,141,7,6,141,240      IC
•1420 DATA 4,141,32,7,169,0,141,188      HM
•1430 DATA 2,169,39,141,189,2,169,0      AD
•1440 DATA 141,4,212,96,169,17,141,11    HM
•1450 DATA 212,162,220,160,15,142,8,212  OO
•1460 DATA 140,39,208,136,208,250,202,224 GG
•1470 DATA 200,208,240,169,12,141,39,208 AE
•1480 DATA 169,0,141,31,208,141,11,212   LL
•1490 DATA 206,191,2,173,191,2,201,47    KL
•1500 DATA 208,39,169,57,141,191,2,141   PF
•1510 DATA 206,7,206,190,2,173,190,2     CH
•1520 DATA 201,47,208,14,169,48,141,205  GL
•1530 DATA 7,141,206,7,169,1,141,192     CM
•1540 DATA 2,96,173,190,2,141,205,7      CD
•1550 DATA 96,141,206,7,96,169,10,162    PB
•1560 DATA 0,160,39,157,0,216,157,224    GE
•1570 DATA 217,153,240,216,153,32,219,232 DF
•1580 DATA 136,192,0,208,238,96          MP
•1590 POKE53280,0:POKE53281,11:PRINT"[CLE
 AR][HOME]"TAB(11)"[RVSON][YELLOW] JEWEL
  QUEST "                                IB
•1600 PRINTTAB(17)"[GREEN]BY":PRINTTAB(12
 )"BOB BLACKMER[DOWN]"                   EH
•1610 PRINT"[YELLOW][CYAN] YOU MUST GATHE
 R THE TEN JEWELS ON EACH  [DOWN]OF NINE
 LEVELS.";                               CP
•1620 PRINT" YOU ACCOMPLISH THIS BY  [DOW
 N]FLYING A GYROCOPTER IN THE JEWEL ROOM.
 "                                       CP
•1630 PRINT"[RIGHT][DOWN]TO FLY USE THE J
 OYSTICK IN PORT #2 AND  [DOWN]PUSH LEFT
 OR RIGHT.";                             PL
•1640 PRINT" TO FLY UP PUSH THE  [DOWN]FI
 RE BUTTON. TO GET A JEWEL JUST TOUCH  [D
 OWN]IT ";                               IO
•1650 PRINT"WITH YOUR LANDING PODS. DONT
 TOUCH[3" "][DOWN]THE VELVET ON WHICH THE
 Y SIT ";                                JO
•1660 PRINT"OR THE[5" "][DOWN]ROBOT GUARD
 S WHICH PATROL FOR THEY SAP  [DOWN]YOUR
 ENERGY."                                PI
•1670 PRINTTAB(4)"[RVSON][YELLOW]PRESS F1
  TO PAUSE DURING GAME"                  NF
•1680 PRINTTAB(8)"[RVSON]PRESS ANY KEY TO
  BEGIN[HOME]":POKE198,0                 OF
•1690 WAIT198,1:PRINT"[CLEAR][3"[DOWN]"][
 3"[RIGHT]"]JUST A MOMENT[3"."][DOWN]":RE
 TURN                                    KD
```

THE IBM CONNECTION

FROM PAGE 61 — COMMTX

```
•0 REM << COMMTX - TRANSMIT TO IBM       OC
•5 REM - COMMODORE PROGRAM -             MD
•6 REM -    -- COMMTX --                 EH
•7 REM - RUPERT REPORT #24               PP
•8 REM - THE IBM CONNECTION              KB
•9 REM -                                 LO
•10 OPEN 2,2,0,CHR$(8)+CHR$(0)           NG
•20 GET K$ : IF K$="" THEN 20            DF
•30 PRINT#2,K$; : PRINT K$;              BI
•40 GOTO 20                              OK
```

COMMRX

```
0 REM << COMMRX - RECEIVE FROM IBM          KI
5 REM - COMMODORE PROGRAM -                 MD
6 REM -      -- COMMRX --                   EN
7 REM - RUPERT REPORT #24                   PP
8 REM - THE IBM CONNECTION                  KB
9 REM -                                     LO
10 OPEN 2,2,0,CHR$(8)+CHR$(0)               NG
20 GET#2,R$ : IF R$="" THEN 20              OD
30 PRINT R$;                                EP
40 GOTO 20                                  OK
```

COMMHS

```
0 REM << COMMHS - HANDSHAKE WITH IBM        HA
1 REM - COMMODORE PROGRAM -                 MD
2 REM      -- COMMHS --                     CN
3 REM RUPERT REPORT #24                     ON
4 REM THE IBM CONNECTION                    EC
5 REM                                       JD
9 REM 1200 BAUD, 8 BITS/CHR, 1 STOP BIT,
 NO PARITY                                  DI
10 OPEN 2,2,0,CHR$(8)+CHR$(0)               NG
20 CR$=CHR$(13)                             PB
25 REM  CLEAR THE RECEIVE BUFFER            JE
30 GET#2,R$ : IF ST<>8 OR ST<>0 THEN 30     PB
35 REM  =-=  MAIN LOOP  =-=                 FP
40 GET#2,R$ : IF R$="" THEN 40              AB
50 M$=M$+R$                                 MB
60 PRINT R$;: IF R$=CR$ THEN GOSUB 80       KP
70 GOTO 40                                  PE
75 REM - TRANSMIT HANDSHAKE MESSAGE -       CM
80 T$="MESSAGE #"+STR$(VAL(M$))+" RECEIV
ED"                                         JC
90 PRINT#2,T$ : M$="" : RETURN              PJ
```

COMMHILO

```
0 REM << COMMHILO - HI-LO GAME WITH IBM     CO
1 REM - COMMODORE PROGRAM -                 MD
2 REM     -- COMMHILO --                    LB
3 REM RUPERT REPORT #24                     ON
4 REM THE IBM CONNECTION                    EC
5 REM                                       JD
6 PRINT CHR$(147)                           FG
10 OPEN 2,2,0,CHR$(8)+CHR$(0)               NG
20 N=INT(RND(0)*1048576)                    GB
30 N$=STR$(N)                               IA
40 GOSUB 2000                               FL
50 IF LEFT$(R$,13)<>"PICK A NUMBER" THEN
 T$="WHAT?" : GOSUB 1000 : GOTO 40          KF
60 T$="ALL RIGHT" : GOSUB 1000              HN
70 PRINT"( MY NUMBER IS";N;")"              IP
80 GOSUB 2000 : NG=NG+1                     GI
90 G$=MID$(R$,6) :V=VAL(G$) :G$=STR$(V)     FB
100 IF G$=N$ THEN 130                       FF
110 IF V>N THEN T$=G$+" IS TOO HIGH" : G
OSUB 1000 : GOTO 80                         HP
120 IF V<N THEN T$=G$+" IS TOO LOW" : GO
SUB 1000 : GOTO 80                          PG
130 T$="THAT'S RIGHT! MY NUMBER IS "+G$+
".  YOU TOOK"+STR$(NG)+" GUESSES."          MC
140 GOSUB 1000 : GOSUB 2000                 PG
150 T$="YOU'RE WELCOME." : GOSUB 1000       NK
155 REM >WAIT TILL DONE TRANSMITTING<       DE
160 IF PEEK(673) AND 1 THEN 160             GO
170 CLOSE 2 : END                           JB
1000 PRINT#2,T$   :REM TRANSMIT T$          CP
1010 RETURN                                 IM
2000 R$=""        :REM RECEIVE R$           JL
2010 GET#2,A$:IF A$="" THEN 2010            AB
2020 IF A$=CHR$(13) THEN 2040               HJ
2030 R$=R$+A$ : GOTO 2010                   DP
2040 PRINT R$ : RETURN                      NL
```

DIRECTORY MANIPULATOR FROM PAGE 113

```
10 REM ******************************       NK
20 REM * DIRECTORY MANIPULATOR INIT *       JD
30 REM ******************************       NK
40 PRINT"[CLEAR]"TAB(9)"[BLACK]DIRECTORY
 MANIPULATOR[CYAN]"                         EJ
50 PRINTTAB(5)"[DOWN][RVSON]INSERT DISKE
TTE TO MANIPULATE":GOSUB1430                NH
60 DIMF$(144):FORI=1TO11:FL$=FL$+CHR$(0)
:NEXT:TY$=CHR$(131)+CHR$(18)+CHR$(0)        KM
70 DIMS%(18):S%(1)=1:FORI=1TO17             IF
80 IFI=6THENS%(I+1)=2:NEXT                  CB
90 IFI=12THENS%(I+1)=3:NEXT                 HO
100 S%(I+1)=S%(I)+3:NEXT                    JG
110 T=18:S=1:N=1:OK=0                       AK
120 SP$="":FORI=1TO16:SP$=SP$+CHR$(160):
NEXT                                        BJ
130 REM *****************                   LO
140 REM * INIT DISK UNIT *                  ID
150 REM *****************                   LO
160 OPEN15,8,15,"I0":GOSUB1550              IN
170 PRINTTAB(12)" DISK UNIT OK ![DOWN]"     PE
180 REM **************************          OG
190 REM * READ DIRECTORY ROUTINE *          PD
200 REM **************************          OG
210 OPEN2,8,2,"#"                           DO
220 PRINT#15,"U1";2;0;T;S                   AM
230 GOSUB1550                               GG
240 GET#2,T$,S$:REM * TRACK & SECTOR OF
NEXT DIR ENTRY *                            EH
250 T=ASC(T$+CHR$(0)):S=ASC(S$+CHR$(0))     MK
260 FORI=1TO8                               JD
270 F$="":FORX=1TO30:REM * GET DIRECTORY
 ENTRIES *                                  JI
280 GET#2,B$:B=ASC(B$+CHR$(0)):IFX=1THEN
A=B                                         BO
290 IFX=4THENC=B                            KE
300 F$=F$+CHR$(B):NEXTX                     HM
310 IFA<>0OR(A=0ANDC=160)THENF$(N)=F$:N=
```

```
N+1                                          ID
•320 GET#2,B$,B$:NEXTI:REM * DIR ENTRIES
 2-7 GARBAGE 1ST 2 BYTES *                   NL
•330 IFT<>0THEN220                           MI
•340 REM ****************************        CE
•350 REM * PRINT DIRECTORY ROUTINE *         OM
•360 REM ****************************        CE
•370 Z=1:OD=0:P1=20:PG=P1:X=INT((N-1)/2)+
 1:IF(N-1)-(2*(X-1))=1THENX=X+1:OD=1         KC
•380 XX=X-1:PC=INT(XX/PG):IF(XX/PG)-PC<>0
 THENPC=PC+1                                 OJ
•390 IFXX>PGTHENX=PG+1                       JG
•400 FORI=1TOXX:PRINT"[BLACK]"RIGHT$(STR$
 (Z),2)"[CYAN]";MID$(F$(Z),4,16):Z=Z+1       KO
•410 IFOD=0OR(OD=1AND2*XX<>X)THENPRINTTAB
 (19)"[UP][BLACK]"RIGHT$(STR$(X),2)"[CYAN
 ]";MID$(F$(X),4,16):X=X+1                   AG
•420 IFINT(I/PG)=1ANDPC>=2THENPG=PG+P1:GO
 SUB1430:PC=PC-1:GOTO440                     FL
•430 GOTO460                                 CK
•440 Z=X:IFPC=>2THENX=Z+P1                   JL
•450 IFPC=1THENX=INT(((2*XX)-(2*I))/2)+Z     DE
•460 NEXTI                                   MN
•470 CLOSE15:CLOSE2                          BC
•480 REM *****************                   JN
•490 REM * CHECK DIR OK? *                   PB
•500 REM *****************                   JN
•510 PRINT:PRINT"[DOWN]DIRECTORY OK (Y/N)
 ";:INPUT"[3"[RIGHT]"]N[3"[LEFT]"]";OK$      KN
•520 IFOK$<>"Y"ANDOK$<>"N"THENPRINT"[3"[U
 P]"]":GOTO510                               HL
•530 IFOK$="Y"ANDOK=0THENGOTO1660:REM * E
 XIT DIR MANIPULATOR *                       LA
•540 IFOK$="Y"ANDOK=1THENGOTO730:REM * RE
 -WRITE DIRECTORY *                          OC
•550 REM ********************                OP
•560 REM * SELECT MANIP CMD *                AG
•570 REM ********************                OP
•580 PRINT"[DOWN]SELECT DIRECTORY MANIPUL
 ATION COMMAND:"                             PN
•590 GETCM$:IFCM$=""THEN590                  OA
•600 IFCM$="[F1]"THENPRINT"RE-LIST DIRECT
 ORY[DOWN]":GOTO370                          HI
•610 IFCM$="H"THENGOSUB1340:GOTO370          OP
•620 OK=1:IFCM$="[F2]"THENPRINT"ALPHABATI
 ZE DIRECTORY":GOSUB920:GOTO370              AK
•630 IFCM$="[F3]"THENPRINT"INSERT BLANK E
 NTRY":GOSUB1010:GOTO370                     II
•640 IFCM$="[F4]"THENPRINT"DELETE BLANK E
 NTRIES":GOSUB1050:GOTO370                   DB
•650 IFCM$="[F5]"THENPRINT"INSERT [RVSON]
 [5"-"][RVSOFF] ENTRY":GOSUB1130:GOTO370     OJ
•660 IFCM$="[F6]"THENPRINT"INSERT 'REMARK
 ' ENTRY":GOSUB1170:GOTO370                  DH
•670 IFCM$="[F7]"THENPRINT"SWAP DIRECTORY
  ENTRIES":GOSUB1230:GOTO370                 GP
•680 IFCM$="[F8]"THENPRINT"DELETE DIRECTO
 RY ENTRY":GOSUB1280:GOTO370                 GK
•690 PRINT"[CLEAR]":GOTO580                  NM
•700 REM ***********************             FC
•710 REM * RE-WRITE DIRECTORY *              NI
•720 REM ***********************             FC
•730 PRINT"[CLEAR][DOWN]  [RVSON]WRITING
 NEW DIRECTORY[3"."]PLEASE WAIT![RVSOFF][
 DOWN]"                                      FG
•740 F$="":FORI=1TO32:F$=F$+CHR$(0):NEXTI    NE
•750 OPEN15,8,15,"I0":GOSUB1550              IN
•760 PRINTTAB(12)" DISK UNIT OK ![DOWN]"     PE
•770 OPEN2,8,2,"#":X=INT((N-1)/8):XX=0:IF
 ((N-1)/8)-X<>0THENX=X+1                     JD
•780 FORI=1TOX:PRINT#15,"B-P:";2;0:REM *
 POSITION BUFFER POINTER *                   KD
•790 T=18:IFI=XTHENT=0:REM * SET NEXT DIR
  SEC POINTER TO 0 IF LAST SECTOR *          MA
•800 PRINT#2,CHR$(T);CHR$(S%(I+1));:REM *
  POINTER TO NEXT TR/SE OF DIR *             FO
•810 FORZ=1TO8:XX=XX+1                       MP
•820 IFXX=>NTHENPRINT#2,F$;:GOTO850          MK
•830 PRINT#2,F$(XX);:REM * PUT DIR ENTRIE
 S INTO BUFFER *                             CJ
•840 IFZ<>8ANDXX<>(N-1)THENPRINT#2,"SG";:
 REM * TRASH BYTES FOR DIR ENTRIES 2-7 *     LH
•850 NEXTZ                                   NM
•860 PRINT#15,"U2:";2;0;18;S%(I):REM * WR
 ITE DIR SECTOR *                            PO
•870 PRINT"WRITING TRACK 18 SECTOR"STR$(S
 %(I))                                       GF
•880 NEXTI:CLOSE2:CLOSE15:GOTO1660           NO
•890 REM **************************          KN
•900 REM * ALPHABATIZE DIRECTORY *           OA
•910 REM **************************          KN
•920 X=N                                     FP
•930 X=INT(X/2):IFX=0THENRETURN              GO
•940 FORI=1TO((N-1)-X):Y=I                   HI
•950 Z=Y+X:IFMID$(F$(Y),4,16)<=MID$(F$(Z)
 ,4,16)THEN970                               EA
•960 FF$=F$(Y):F$(Y)=F$(Z):F$(Z)=FF$:Y=Y-
 X:IFY>0THEN950                              KF
•970 NEXT:GOTO930                            OD
•980 REM ***********************             FC
•990 REM * INSERT BLANK ENTRY *              OP
•1000 REM ***********************            FC
•1010 GOSUB1490:F$(BL)=CHR$(0)+CHR$(0)+CH
 R$(0)+SP$+FL$:RETURN                        LH
•1020 REM *************************          JL
•1030 REM * DELETE BLANK ENTRIES *           AE
•1040 REM *************************          JL
•1050 FORI=1TON-1:IFASC(F$(I))=0THEN1070     AE
•1060 NEXT:RETURN                            EJ
•1070 FORX=BLTON-1                           OL
•1080 IFBL<N-1THENF$(X)=F$(X+1)              AO
•1090 NEXT:N=N-1:GOTO1050                    HJ
•1100 REM ***********************            FC
•1110 REM * INSERT ----- ENTRY *             CC
•1120 REM ***********************            FC
•1130 GOSUB1490:F$(BL)=TY$+"[16"-"]"+FL$:
```

```
RETURN                                        OL
•1140 REM **************************          KN
•1150 REM * INSERT 'REMARK' ENTRY *           DK
•1160 REM **************************          KN
•1170 GOSUB1490:PRINT"ENTER REMARK:";:INP
UTRM$:IFLEN(RM$)>16THEN1170                   MB
•1180 IFLEN(RM$)<16THENFORI=1TO(16-LEN(RM
$)):RM$=RM$+CHR$(160):NEXT                    MO
•1190 F$(BL)=TY$+RM$+FL$:RETURN               IK
•1200 REM **************************          KN
•1210 REM * SWAP DIRECTORY ENTRIES *          NG
•1220 REM **************************          KN
•1230 PRINT"1ST ";:GOSUB1490:A=BL:PRINT"2
ND ";:GOSUB1490:F$(B)=F$(A):F$(A)=F$(BL) BG
•1240 F$(BL)=F$(B):RETURN                     KO
•1250 REM ***************************         OG
•1260 REM * DELETE DIRECTORY ENTRY *          JC
•1270 REM ***************************         OG
•1280 GOSUB1490:FORX=BLTON-1                  JH
•1290 IFBL<N-1THENF$(X)=F$(X+1)               AO
•1300 NEXT:N=N-1:RETURN                       LA
•1310 REM *************                       MF
•1320 REM * HELP MENU *                       DM
•1330 REM *************                       MF
•1340 PRINT"[CLEAR][DOWN][3" "][RVSON]DIR
ECTORY MANIPULATOR HELP MENU[DOWN]"           BA
•1350 PRINT"[3" "]F1 -> RE-LIST DIRECTORY
[DOWN]":PRINT"[3" "]F2 -> ALPHABATIZE DI
RECTORY[DOWN]"                                NO
•1360 PRINT"[3" "]F3 -> INSERT BLANK ENTR
Y[DOWN]":PRINT"[3" "]F4 -> DELETE BLANK
ENTRIES[DOWN]"                                MP
•1370 PRINT"[3" "]F5 -> INSERT [RVSON][5"
-"][RVSOFF] ENTRY[DOWN]":PRINT"[3" "]F6
-> INSERT 'REMARK' ENTRY[DOWN]"               AA
•1380 PRINT"[3" "]F7 -> SWAP DIRECTORY EN
TRIES[DOWN]":PRINT"[3" "]F8 -> DELETE DI
RECTORY ENTRY"                                AH
•1390 GOSUB1430:RETURN                        CO
•1400 REM **********************              FC
•1410 REM * HIT KEY SUBROUTINE *              PO
•1420 REM **********************              FC
•1430 PRINT:PRINTTAB(13)"HIT ANY KEY[3"!"
][DOWN]"                                      JL
•1440 GETCK$:IFCK$=""THEN1440                 CE
•1450 RETURN                                  IM
•1460 REM ********************************
******************                            JO
•1470 REM * LOC OF ENTRY/MOVE DIR ARRAY E
NTRIES SUBROUTINE *                           BN
•1480 REM ********************************
******************                            JO
•1490 PRINT"LOCATION OF ENTRY:[4" "][4"[L
EFT]"]";:INPUTBL:IFBL>N-1ORBL<1THENPRINT
"[UP][UP]":GOTO1490                           BN
•1500 IFCM$="[F7]"ORCM$="[F8]"THENRETURN      AA
•1510 N=N+1:FORI=N-1TOBL+1STEP-1:F$(I)=F$
(I-1):NEXT:RETURN                             CJ
•1520 REM *********************               CF
•1530 REM * DISK STATUS CHECK *               DA
•1540 REM *********************               CF
•1550 INPUT#15,EN,EM$,ET,ES:IFEN<>0THENGO
TO1600                                        CJ
•1560 RETURN                                  IM
•1570 REM ***************************         CE
•1580 REM * DISK UNIT ERROR ROUTINE *         MF
•1590 REM ***************************         CE
•1600 PRINT"[CLEAR]"TAB(12)"[RVSON]DISK U
NIT ERROR!"                                   NK
•1610 PRINT"[DOWN]ERROR # -"EN"[LEFT]; TR
ACK -"ET"[LEFT]; SECTOR  -"SE                 DH
•1620 PRINT"[DOWN]ERROR MSG - "EM$:END        HO
•1630 REM *******************************     NK
•1640 REM * EXIT DIRECTORY MANIPULATOR *      BN
•1650 REM *******************************     NK
•1660 PRINT"[CLEAR][DOWN]MANIPULATE ANOTH
ER DISKETTE (Y/N)";:INPUT"[3"[RIGHT]"]N[
3"[LEFT]"]";AN$                               GJ
•1670 IFAN$<>"Y"ANDAN$<>"N"THEN1660           EI
•1680 PRINT"[DOWN]DISKETTE BEING VALIDATE
D":OPEN15,8,15:PRINT#15,"V":PRINT#15,"I"
:CLOSE15                                      CL
•1690 IFAN$="Y"THENRUN                        OC
•1700 END                                     IC
```

GAMELOADER
FROM PAGE 107

```
•1 REM ************************               JL
•2 REM *      GAMELOADER      *               LI
•3 REM *     BY TIM BROWN     *               PK
•4 REM ************************               JL
•5 POKE53281,12:POKE53280,12:PRINT"[CLEAR
][BLACK]"                                     KJ
•10 PRINT"[DOWN][DOWN]BASIC LOADER CONSTR
UCTION"                                       IB
•20 INPUT"ENTER PROGRAM NAME";NA$             NO
•30 INPUT"[DOWN]ENTER ADDRESS TO SYS";AD$ EN
•40 NX$=LEFT$(NA$,1)+"X":AD=VAL(AD$)          FL
•50 PRINT"[DOWN][DOWN]INSERT PROGRAM DISK
 INTO DRIVE"                                  CO
•60 PRINT"[5"[RIGHT]"]Y/N"                    FK
•70 GETA$:IFA$<>"Y"ANDA$<>"N"THEN70           KG
•80 IFA$="N"THENGOSUB9000:GOTO50              EP
•100 PRINT"[CLEAR][4"[DOWN]"]NOW CONSTRUC
TING LOADER"                                  MJ
•110 OPEN1,8,15:PRINT#1,"R0:"+NX$+"="+NA$ GA
•115 INPUT#1,E,E$:IFE>0THENPRINT"[CLEAR][
5"[DOWN]"]ERROR !":CLOSE1:GOTO10              EO
•117 CLOSE1:PRINT"[CLEAR]":PRINT"[3"[DOWN
```

```
]"]NEW[3"[DOWN]"]"                                          NH
·120 PRINT"100 IFA=0THENA=1:LOAD"CHR$(34)
NX$CHR$(34)",8,1"                                           MO
·130 PRINT"110 PRINT"CHR$(34)"READY"CHR$(
34)                                                         MG
·140 PRINT"130 SYS"AD":NEW"                                 JI
·145 PRINT"SAVE"CHR$(34)NA$CHR$(34)",8"                     KK
·150 PRINT"[HOME]";:FORR=631TO644:POKER,1
3:NEXT                                                      OJ
·160 POKE198,13:END                                         KD
·9000 S=54272:FORE=STOS+28:POKEE,0:NEXT                     LA
·9010 POKE54296,15:POKE54277,0:POKE54278,
240                                                         MK
·9020 POKE54275,1:POKE54274,0                               FO
·9030 POKE54273,33:POKE54272,135:POKE5427
6,65                                                        IE
·9040 FORT=1TO500:NEXT:POKE54276,64                         GL
·9050 POKE54296,0                                           PK
·9090 RETURN                                                IM
```

CLOAK
FROM PAGE 108

```
·100 MP=828:KEY=882:BY=254:TL=13776:CS=0                    MN
·102 PRINT"[CLEAR]DATA CLOAK[DOWN][DOWN]"                   EI
·104 READ K:IFK<0THEN108                                    BE
·106 CS=CS+K:POKEMP,K:MP=MP+1:GOTO104                       OB
·108 IF CS<>TL THENPRINT"[RVSON]ERROR="CS
:GOTO154                                                    DI
·110 PRINT"OKAY":SYSKEY:KEY=KEY-1                           HK
·112 PRINT"ENCRYPTION KEY":INPUT KY$:IFKY
$=""THEN154                                                 LJ
·114 PRINT"SOURCE FILENAME":INPUT N1$:IFN
1$=""THEN154                                                OM
·116 PRINT"FILE TYPE (P/S/U)":INPUT SF$:I
FSF$=""THENSF$="P"                                          AC
·118 PRINT"NEW FILENAME":INPUT N2$:IFN2$=
""THEN154                                                   IP
·120 PRINT"FILE TYPE (P/S/U)":INPUT NF$:I
FNF$=""THENNF$="P"                                          PF
·122 SF$=","+LEFT$(SF$,1)+",R":NF$=","+LE
FT$(NF$,1)+",W"                                             DM
·124 N1$="0:"+LEFT$(N1$,16)+SF$:N2$="0:"+
LEFT$(N2$,16)+NF$                                           DL
·126 PRINT"OPENING ";N1$:OPEN15,8,15,"I"                    CN
·128 OPEN2,8,2,N1$:GOSUB158:PRINTDK$:IFER
THEN154                                                     LL
·130 PRINT"OPENING ";N2$                                    AM
·132 OPEN 3,8,3,N2$:GOSUB158:PRINTDK$:IFE
RTHEN154                                                    OA
·134 FORLP=1TOLEN(KY$):POKEKEY+LP,ASC(MID
$(KY$,LP,1)):NEXTLP                                         EC
·136 POKEKEY+LP,0:PRINT"CRYPTING WAIT"                      CL
·138 ER=1                                                   HL
·140 GET#2,Q$:IF STATUS AND 64 THENER=0                     LB
·142 K=0:IFQ$=""THEN146                                     NH
·144 K=ASC(Q$)                                              KO
·146 POKEBY,K:SYS828:K=PEEK(BY)                             GE
·148 PRINT#3,CHR$(K);:IFERTHEN140                           CI
·150 GOSUB158:PRINTDK$:IFERTHEN154                          FE
·152 PRINT" ALL DONE."                                      FA
·154 CLOSE2:CLOSE3:CLOSE15:END                              NA
·156 REM DISK ERRORS                                        JM
·158 ER=0:INPUT#15,E1,E2$,E3,E4                             JL
·160 DK$=STR$(E1)+CHR$(32)+E2$                              HD
·162 IFE1>20THENER=1:DK$=CHR$(18)+DK$                       OA
·164 RETURN                                                 IM
·166 DATA 222,135,090,041,121                               EJ
·168 DATA 063,132,255,132,178                               CH
·170 DATA 203,129,179,122,138                               FH
·172 DATA 121,254,135,026,210                               PN
·174 DATA 054,054,121,203,129                               AD
·176 DATA 112,234,120,051,103                               NM
·178 DATA 235,129,026,211,070                               CJ
·180 DATA 255,129,211,121,255                               EI
·182 DATA 134,211,122,210,235                               HI
·184 DATA 129,178,186,086,170                               KN
·186 DATA 131,054,152,134,169                               AE
·188 DATA 093,141,002,003,169                               CN
·190 DATA 003,141,003,003,169                               OD
·192 DATA 060,133,251,169,003                               AC
·194 DATA 133,252,160,000,132                               HF
·196 DATA 253,177,251,073,122                               IO
·198 DATA 145,251,200,192,054                               GP
·200 DATA 208,245,169,114,133                               FG
·202 DATA 251,169,003,133,252                               AB
·204 DATA 096,255,-7                                        HB
```

LINEOUT
FROM PAGE 90

```
·1 REM ** LINEOUT ** BUCK CHILDRESS ** BO
X 13575, SALEM, OR 97309 ** 9,15,85                         MA
·2 PRINT"[CLEAR][BLACK]LOADING AND CHECKI
NG DATA[3"."]"                                              DK
·3 FORJ=49152TO49447:READA:POKEJ,A:X=X+A:
NEXT                                                        ID
·4 IFX<>35036THENPRINT"[DOWN]ERROR IN DAT
A[3"."]":END                                                LA
·5 PRINT"[DOWN]DATA IS OK AND LOADED[3"."
]"                                                          FE
·6 PRINT"[DOWN]SYS 49152 TO ACTIVATE[3"."
]":END                                                      EE
·7 DATA169,6,133,252,160,0,132,251,185,19
9,192,32                                                    LJ
·8 DATA210,255,200,196,252,144,245,132,25
4,169,0,133                                                 OL
·9 DATA253,169,0,133,204,32,228,255,240,2
47,201,13                                                   FI
·10 DATA240,26,201,20,240,214,201,48,144,
```

```
235,201,58                                      LA
•11 DATA176,231,230,253,166,253,224,6,176
,223,32,210                                     CK
•12 DATA255,76,25,192,165,253,240,213,230
,252,230,252                                    EJ
•13 DATA230,252,230,251,164,254,165,251,2
01,2,240,180                                    FE
•14 DATA201,3,176,10,165,252,24,105,5,133
,252,76                                         GJ
•15 DATA8,192,169,32,32,210,255,160,0,185
,120,4                                          DB
•16 DATA153,48,193,200,192,38,144,245,160
,43,185,199                                     PF
•17 DATA192,32,210,255,200,192,88,144,245
,169,8,133                                      HP
•18 DATA198,169,13,160,0,153,119,2,200,19
2,8,144                                         FP
•19 DATA248,169,19,32,210,255,76,49,168,1
60,0,185                                        FL
•20 DATA225,5,153,50,193,200,192,6,144,24
5,160,0                                         BN
•21 DATA76,118,192,160,0,185,48,193,153,1
84,5,200                                        HN
•22 DATA192,29,144,245,162,0,189,31,193,1
53,184,5                                        ON
•23 DATA232,200,224,9,144,244,96,147,17,1
7,17,66                                         CJ
•24 DATA61,32,32,32,32,32,58,69,61,58,73,
61                                              HN
•25 DATA147,17,17,17,73,70,66,62,69,84,72
,69                                             LD
•26 DATA78,80,79,75,69,49,57,56,44,48,58,
69                                              IC
•27 DATA78,68,17,17,13,63,66,17,13,17,17,
80                                              PC
•28 DATA79,75,69,50,49,52,44,53,13,145,14
5,145                                           FK
•29 DATA83,89,83,52,57,51,50,51,17,13,17,
17                                              NF
•30 DATA17,17,17,83,89,83,52,57,51,48,53,
58                                              AD
•31 DATA2,61,2,43,9,58,63,2                     JB
```

GYPSY STARSHIP

FROM PAGE 18 — VIDEO SETUP

```
•1 REM *** VIDEO SETUP  ***                     KF
•2 REM CREATES 'GYPSY VIDEO' FOR 'GYPSY'        PI
•5 POKE 55,255:POKE 56,127:POKE 643,255:P
OKE 644,127:PRINT "[CLEAR]"                     KE
•7 F$=" ":C0%=0:C1%=0:C2%=0:C3%=0:C4%=0:C
5%=0:C6%=0:SP%=0                                NO
•8 DEF FN PG(X)=INT(X/256):DEF FN LO(X)=X
-256*(INT(X/256))                               EF
•10 GOSUB 90:GOSUB 600                          GA
•12 PRINT "[CLEAR]";:GOSUB 95:GOSUB 700:G
OSUB 2000                                       CM
•13 GOSUB 900                                   DB
•14 SYS 38046:POKE 648,140                      AE
•15 REM ** ENABLE SPRITES                       OD
•16 FOR I=0 TO 199:NEXT:POKE ES,31:POKE 3
6839,32                                         HM
•17 PRINT LL$BL$LL$"[RVSON]PRESS BUTTON[R
VSOFF] TO CREATE 'GYPSY VIDEO'";:GOTO 10
0                                               BO
•19 REM ** LOAD SUBROUTINE                      GD
•20 FOR I=XB TO XE:READ A:POKE I,A:NEXT:P
RINT "[RVSON].[RVSOFF]";:RETURN                 MG
•90 POKE 53265,0:RETURN                         MO
•95 POKE 53265,91:RETURN                        PH
•98 REM      *** ACTION LOOP ***                KJ
•100 IF C0%>0 THEN C0%=0:GOTO 300               KB
•196 GOTO 100                                   CF
•298 REM     *** END HANDLING ***               AB
•299 REM ** PUT VIDEO MEMORY BACK TO FIRS
T BLOCK, AND SCREEN MEMORY TO 1024              EG
•300 GOSUB 90:POKE ES,0:REM DISABLE SPRIT
ES                                              LO
•304 REM RESTORE VIDEO/SCREEN MEMORY            AK
•305 POKE 56578,PEEK(56578)OR3:POKE 56576
,(PEEK(56576)AND 252)OR 3                       MB
•310 POKE 53272,20:POKE 648,4:SYS 40768         OJ
•360 POKE 37894,PEEK(45):POKE 37895,PEEK(
46)                                             PA
•365 POKE 43,0:POKE 44,128:POKE 45,255:PO
KE 46,159                                       HA
•370 SAVE "@0:GYPSY VIDEO",8,1                  DH
•375 POKE 43,1:POKE 44,8:POKE 45,PEEK(378
94):POKE 46,PEEK(37895)                         HC
•380 POKE 657,0:POKE 792,71:POKE 808,237        PK
•385 GOSUB 95:POKE 37952,0:POKE 37953,0         GI
•390 SYS 65126                                  KI
•598 REM     *** ARRANGE MEMORY ***             KB
•600 VB=32768:POKE 56578,PEEK(56578)OR3:P
OKE 56576,(PEEK(56576)AND 252)OR 1              CN
•602 SB=0:POKE 53272,(SB*16)+4:SB=VB+1024
*SB                                             MO
•604 BB=SB/256:POKE 648,BB                      AK
•611 REM ** SPRITE COLOR TABLE                  LA
•612 CT(0)=53287:FOR I=1 TO 7:CT(I)=CT(I-
1)+1:NEXT                                       AN
•614 HT(0)=53248:FOR I=1 TO 7:HT(I)=HT(I-
1)+2:NEXT                                       KC
•616 VT(0)=53249:FOR I=1 TO 7:VT(I)=VT(I-
1)+2:NEXT                                       AJ
•618 HR=53264                                   FB
•620 ES=53269                                   FE
•622 POKE 53271,0:POKE 53277,0:POKE 53275
,0:POKE 53276,30                                GD
•628 EM=53276                                   EK
•630 POKE 53285,15:POKE 53286,7                 FK
•635 FOR I=0 TO 7:BC(I)=255-BS(I):NEXT          LB
•638 REM     *** INITIALIZE VALUES ***          DK
•640 PRINT "[c 7]";                             KM
```

```
•642 POKE 53281,0                                   AF
•644 POKE 53280,0                                   AE
•646 POKE CT(0),7:POKE CT(1),5:POKE CT(2)
,2:POKE CT(3),6:POKE CT(4),12                       EE
•659 REM       *** ML TABLE SETUP ***               CA
•661 POKE 37920,4:POKE 37921,4                      CB
•663 POKE 37922,1                                   PO
•665 POKE 37923,0                                   PA
•667 POKE 37924,1:POKE 37925,1                      FL
•669 POKE 37936,1                                   AJ
•671 POKE 37940,1                                   PO
•673 POKE 37941,0                                   PA
•675 POKE 37926,3:POKE 37928,3                      GI
•677 POKE 37927,0:POKE 37935,0:POKE 37943
,0                                                  MA
•679 POKE 53282,1:POKE 53283,7:POKE 53284
,9                                                  GD
•694 POKE 657,128                                   BJ
•696 RETURN                                         IM
•699 REM *** INTRO SCREEN ***                       PN
•700 PRINT "[CLEAR][5"[DOWN]"]"TAB(14)"[s
 G][s Y][s P][s S][s Y][SS][s P][s I][s
 L][s O][s T]"                                      KL
•710 PRINT:PRINT TAB(6)"[RVSON][s Y][s O]
 [s U][s R][SS][s S][s H][s I][s P][SS][s
  I][s S][SS][s B][s E][s I][s N][s G][SS
 ][s P][s R][s E][s P][s A][s R][s E][s D
 ][RVSOFF]":PRINT:PRINT                             NO
•715 RETURN                                         IM
•898 REM       *** SPRITE POSITIONS ***             KA
•900 FOR I=1 TO 4:POKE HT(I),20+INT(RND(9
)*220)                                              DK
•901 POKE VT(I),50+INT(RND(9)*190):NEXT             JM
•902 POKE HR,0                                      IJ
•909 REM ** PUT STARS ON THE SCREEN                 MF
•910 PRINT "[CLEAR]";:FOR I=0 TO 49:POKE
VB+INT(RND(9)*1024),46:NEXT                         EO
•915 FOR I=0 TO 8:POKE VB+INT(RND(9)*1024
),42:NEXT                                           IK
•919 REM ** STARSHIP POSITION                       LP
•920 POKE 53248,175:POKE 53249,150                  AE
•921 REM ** STARSHIP DIRECTION                      CN
•922 POKE VB+1016,16                                ED
•930 LL$="[HOME][23"[DOWN]"]"                       BE
•931 BL$="[39" "]":BL$=BL$+BL$+" "                  AM
•946 RETURN                                         IM
•1998 REM     ***  MACHINE LANGUAGE  ***            OA
•1999 REM ** STARTUP SYS ROUTINE                    JO
•2000 POKE 37888,PEEK(788):POKE 37889,PEE
K(789)                                              LB
•2001 XB=38046:XE=38079:GOSUB 20                    AI
•2002 REM SET INTERR.VECTOR TO INTERR.HAN
DLER#1 AND SCANLINE 234                             CI
•2003 REM SEI LDA#0 STA 788 LDA#154 STA 7
89 LDA#234 STA 53266                                GP
•2004 DATA 120,169,0,141,20,3,169,154,141
,21,3,169,234,141,18,208                            PA
•2005 REM HIGH BIT, ENABLE SCAN INTERR.,
DISABLE TIMER INTERR., QUIT                         NJ
•2006 REM LDA 53265 AND#127 STA 53265 LDA
#1 STA 53274 STA 56333 CLI RTS                      PK
•2007 DATA 173,17,208,41,127,141,17,208,1
69,1,141,26,208,141,13,220,88,96                    LA
•2019 REM    ***  ANIMATION SHELL  ***              KJ
•2020 XB=38144:XE=38176:GOSUB 20                    DD
•2023 DATA 206,32,148,240,3,108,10,148              BE
•2026 DATA 173,33,148,141,32,148                    ED
•2029 DATA 206,34,148,208,5,169,8,141,34,
148,174,34,148,202                                  OK
•2032 DATA 173,35,148,240,6                         LH
•2035 A=192:B=248:FOR I=38177 TO 38219 ST
EP 6:POKE I,189:POKE I+1,A:POKE I+2,148             MN
•2036 POKE I+3,141:POKE I+4,B:POKE I+5,13
1:A=A+8:B=B+1:NEXT                                  BG
•2039 POKE 38225,108:POKE 38226,10:POKE 3
8227,148                                            KK
•2049 REM    *** MOVEMENT COUNTER ***               HI
•2050 XB=38272:XE=38288:GOSUB 20                    EL
•2051 X=38272:POKE 37896,FN LO(X):POKE 37
897,FN PG(X)                                        EI
•2052 POKE 37898,FN LO(X):POKE 37899,FN P
G(X)                                                MC
•2055 DATA 206,36,148,240,3,108,12,148              GC
•2058 DATA 173,37,148,141,36,148,108,2,14
8                                                   EA
•2059 REM ** BITSET SUBROUTINE **                   EI
•2060 XB=38314:XE=38323:GOSUB 20                    BM
•2063 DATA 185,74,148,13,16,208,141,16,20
8,96                                                EH
•2069 REM ** BITCLEAR SUBROUTINE **                 KG
•2070 XB=38324:XE=38335:GOSUB 20                    CK
•2073 DATA 185,74,148,73,255,45,16,208,14
1,16,208,96                                         CF
•2099 REM       *** XMOVE ***                       EL
•2100 XB=38400:XE=38467:GOSUB 20                    CJ
•2103 DATA 169,1,57,75,148,240,3,32,128,1
50                                                  GE
•2109 DATA 169,2,57,75,148,240,3,32,192,1
50                                                  CM
•2119 DATA 169,4,57,75,148,240,17,185,74,
148,45,16,208,240,6                                 KM
•2122 DATA 32,0,151,76,44,150,32,64,151             FE
•2128 DATA 169,8,57,75,148,208,1,96,185,7
4,148,45,16,208,240,4                               HN
•2131 DATA 32,128,151,96,32,192,151,96              OB
•2139 REM    *** UPMOVE SUBROUTINE ***              NE
•2140 XB=38528:XE=38561:GOSUB 20                    BL
•2143 DATA 190,1,208,202,138,217,90,148,2
08,3,32,146,150,138,153,1,208,96                    BB
•2146 DATA 173,48,148,208,4,232,76,247,14
9,190,91,148,202,76,247,149                         OB
•2159 REM    *** DOWNMOVE SUBROUTINE ***            PI
•2160 XB=38592:XE=38625:GOSUB 20                    CJ
•2163 DATA 190,1,208,232,138,217,91,148,2
08,3,32,210,150,138,153,1,208,96                    NF
•2166 DATA 173,48,148,208,4,202,76,247,14
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9,190,90,148,232,76,247,149              OM
•2179 REM *** LEFTMOVE (HI BIT SET) ***   KO
•2180 XB=38656:XE=38669:GOSUB 20          GC
•2183 DATA 190,0,208,202,16,3,32,180,149,
138,153,0,208,96                          DC
•2199 REM *** LEFTMOVE (HI BIT CLR) ***   KJ
•2200 XB=38720:XE=38756:GOSUB 20          LH
•2203 DATA 190,0,208,202,138,217,106,148,
208,3,32,82,151,138,153,0,208,96          FL
•2206 DATA 173,48,148,208,4,232,76,247,14
9,190,107,148,202,32,170,149,76,247,149   PA
•2219 REM *** RIGHTMVE (HI BIT SET) ***   CM
•2220 XB=38784:XE=38820:GOSUB 20          CL
•2223 DATA 190,0,208,232,138,217,107,148,
208,3,32,146,151,138,153,0,208,96         BE
•2226 DATA 173,48,148,208,4,202,76,247,14
9,190,106,148,232,32,180,149,76,247,149   MI
•2239 REM *** RIGHTMVE (HI BIT CLR) ***   LP
•2240 XB=38848:XE=38861:GOSUB 20          CL
•2243 DATA 190,0,208,232,208,3,32,170,149
,138,153,0,208,96                         ND
•2399 REM *** BASIC MOVEMENT HANDLER ***  AN
•2400 XB=38336:XE=38346:GOSUB 20          BL
•2403 DATA 160,59,177,45,170,188,56,148,7
6,0,150                                   OI
•2469 REM ** REPORT NON-SPRITE-0 WRAPS AN
D EDGES TO BASIC                          PI
•2470 XB=38391:XE=38399:GOSUB 20          EC
•2473 DATA 192,0,208,1,96,140,55,148,96   OO
•2499 REM    *** READ JOYSTICK ***        BO
•2500 XB=38912:XE=38972:GOSUB 20          FC
•2502 X=38912:POKE 37890,FN LO(X):POKE 37
891,FN PG(X)                              DN
•2508 DATA 173,0,220,141,45,148,41,16,208
,8,169,1,141,39,148,32,0,153              AD
•2511 DATA 173,45,148,41,15,201,15,208,3,
108,12,148,73,15,141,75,148,32,128,152    AN
•2514 DATA 160,0,32,0,150,32,160,152,173,
4,148,141,10,148                          OM
•2516 DATA 173,5,148,141,11,148,108,12,14
8                                         EH
•2529 REM *** INTERR.MOVE.HANDLER ***     PG
•2530 XB=38976:XE=39009:GOSUB 20          PM
•2531 POKE 37892,FN LO(XB):POKE 37893,FN
PG(XB)                                    IF
•2534 DATA 160,0,32,0,150,32,160,152      BJ
•2537 DATA 206,40,148,208,243,173,38,148,
141,40,148                                LH
•2540 DATA 173,8,148,141,10,148,173,9,148
,141,11,148,108,12,148                    FG
•2549 REM *** SET SHAPE 0 ***             DB
•2550 XB=39040:XE=39057:GOSUB 20          BC
•2553 DATA 173,35,148,208,9,172,75,148,18
5,63,148,141,248,131,32,64,153,96         FI
•2569 REM ** SPRITE 0 COLLISION ROUTINE   AM
•2570 XB=39072:XE=39111:GOSUB 20          DC
•2573 DATA 173,52,148,240,16,173,30,208,1
41,41,148,41,1,240,6                      LG
•2575 DATA 32,80,153,76,208,152           FI
•2578 DATA 173,53,148,240,13,173,31,208,4
1,1,240,3,32,112,153,76,208,152,96        CD
•2579 REM ** UNMOVE **                    AI
•2580 XB=39120:XE=39148:GOSUB 20          PK
•2583 DATA 169,1,141,40,148,172,75,148,18
5,121,148,141,75,148                      OB
•2586 DATA 160,0,32,0,150,172,75,148,185,
121,148,141,75,148,96                     OC
•2599 REM ** INTERRUPT HANDLER 1 **       KL
•2600 XB=39424:XE=39449:GOSUB 20          AP
•2601 FOR I=36856 TO 36860:POKE I,48:NEXT HH
•2602 REM CLEAR INTERR.FLAG, RESET VECTOR
, SET NEW SCANLINE                        OO
•2603 REM LDA#15 STA 53273 LDA#64 STA 788
 LDA#254 STA 53266                        JH
•2604 DATA 169,15,141,25,208,169,64,141,2
0,3,169,254,141,18,208                    ON
•2605 REM CHANGE SCREEN POINTER AND QUIT  PJ
•2606 REM LDA#52 STA 53272 PLA TAY PLA TA
X PLA RTI                                 EK
•2607 DATA 169,52,141,24,208,104,168,104,
170,104,64                                AA
•2615 FOR I=35840 TO 35903:POKE I,0:NEXT  FA
•2620 XB=39488:XE=39510:GOSUB 20          NK
•2621 REM CLEAR INTERR.FLAG, RESET VECTOR
, SET NEW SCANLINE                        OO
•2622 REM LDA#15 STA 53273 LDA#0 STA 788
LDA#234 STA 53266                         BH
•2623 DATA 169,15,141,25,208,169,0,141,20
,3,169,234,141,18,208                     AI
•2624 REM SET SCREEN POINTER, JUMP TO ANI
M. SHELL                                  FE
•2625 REM LDA#4 STA 53272 JMP 38144       JN
•2626 DATA 169,4,141,24,208,76,0,149      IA
•2699 REM ** BASIC VARIABLE SUBROUTINES   DD
•2700 XB=39168:XE=39174:GOSUB 20          KD
•2701 REM ** REPORT FIREBUTTON - C0%      LD
•2703 DATA 160,10,169,1,145,45,96         PP
•2709 REM ** REPORT SPRITES TO BASIC      PN
•2710 XB=39184:XE=39222:GOSUB 20          CJ
•2711 REM C1%=EDGEWRAP, C2%=S/S COLLIS.   JP
•2713 DATA 160,17,173,55,148,240,2,145,45
,160,24,173,49,148,240,2,145,45           LI
•2714 REM C3%=S/FOREG.COLLIS.             MF
•2716 DATA  160,31,173,50,148,240,2,145,4
5                                         CL
•2718 DATA 169,0,141,49,148,141,50,148,14
1,55,148,96                               KJ
•2719 REM ** REPORT MOVEMENT              BK
•2720 XB=39232:XE=39241:GOSUB 20          BC
•2721 REM C4%                             DE
•2723 DATA 160,38,169,1,145,45,141,47,148
,96                                       NK
•2729 REM ** REPORT SPRITE 0 BOUNCE/S     MP
•2730 XB=39248:XE=39257:GOSUB 20          AC
•2731 REM C5%                             DF
•2733 DATA 160,45,173,41,148,41,254,145,4
```

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5,96                                           DH
·2739 REM ** REPORT SPRITE 0 BOUNCE/F          MA
·2740 XB=39280:XE=39289:GOSUB 20               CF
·2741 REM C6%                                  DC
·2743 DATA 160,52,169,1,145,45,141,42,148
,96                                            LP
·2898 REM   *** WRAPUP ***                     HC
·2900 XB=40704:XE=40741:GOSUB 20               CB
·2901 REM ** SET COLLISION VECTOR              FI
·2902 X=40704:POKE 37900,FN LO(X):POKE 37
901,FN PG(X)                                   HB
·2908 DATA 173,30,208,141,49,148,173,31,2
08,141,50,148,32,16,153                        ED
·2909 REM MOVE THE NEXT PLANET                 JO
·2910 REM LDX 37934 DEX BNE+2 LDX #4 STX
37934 LDY(37944),X JSR 38400                   FN
·2911 DATA 174,46,148,202,208,2,162,4,142
,46,148,188,56,148,32,0,150                    HL
·2915 REM END INTERRUPT ROUTINE                CM
·2916 REM PLA,TAY,PLA,TAX,PLA,RTI              GF
·2917 DATA 104,168,104,170,104,64              IK
·2949 REM ** RESTORE VIDEO (UNSYS)             KF
·2950 XB=40768:XE=40792:GOSUB 20               HF
·2951 REM SET INTERR. VECTOR TO NORMAL HO
USEKEEPING, TIMED INTERRUPTS                   CI
·2952 REM SEI LDA 37888 STA 788 LDA 37889
STA 789                                        FB
·2953 DATA 120,173,0,148,141,20,3,173,1,1
48,141,21,3                                    CC
·2954 REM LDA#0 STA 53274 LDA#129 STA 563
33 CLI RTS                                     AK
·2955 DATA 169,0,141,26,208,169,129,141,1
3,220,88,96                                    KA
·2998 REM  *** SET UP SPRITE SHAPES ***        BK
·2999 REM ** PLANETS                           AK
·3000 FOR I=34304 TO 34816 STEP 512:FOR J
=0 TO 448 STEP 64:FOR K=0 TO 20                AJ
·3001 READ A:POKE I+J+K,A:NEXT                 AO
·3002 FOR K=21 TO 63:POKE I+J+K,0:NEXT:NE
XT:GOSUB 3985:NEXT                             FF
·3009 REM ** PLANET 1 SHAPE DATA               HM
·3010 DATA 0,40,0,0,175,0,82,191,192,82,1
75,128,2,191,128,0,171,0,0,40,0                DC
·3011 DATA 0,40,0,0,190,0,2,255,128,5,190
,128,5,254,128,0,175,0,0,40,0                  IL
·3012 DATA 0,40,0,0,250,0,3,254,128,2,90,
128,3,90,128,0,190,0,0,40,0                    DM
·3013 DATA 0,40,0,0,234,0,3,250,128,3,229
,128,3,229,128,0,250,0,0,40,0                  HF
·3014 DATA 0,40,0,0,170,0,3,234,80,3,170,
80,3,170,128,0,234,0,0,40,0                    JN
·3015 DATA 0,40,0,0,170,20,3,170,212,2,17
0,128,2,170,192,0,170,0,0,40,0                 CA
·3016 DATA 0,40,0,0,170,64,2,171,192,2,17
0,192,2,171,192,0,170,0,0,40,0                 NH
·3017 DATA 0,40,0,5,171,0,6,175,192,2,171
,192,2,175,192,0,170,0,0,40,0                  JJ
·3019 REM ** PLANET 2 SHAPE DATA               GP
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·3020 DATA 0,40,0,3,170,192,62,170,148,16
2,170,143,42,255,252,2,255,192,0,40,0          JC
·3021 DATA 0,40,0,3,106,192,61,106,188,24
1,106,143,62,171,252,2,171,192,0,40,0          LA
·3022 DATA 0,24,0,3,90,192,61,90,188,81,9
0,143,63,234,188,3,234,128,0,24,0              EL
·3023 DATA 0,20,0,3,86,192,61,86,188,241,
86,138,61,255,168,1,255,128,0,20,0             OP
·3024 DATA 0,20,0,3,85,128,61,85,104,241,
85,74,63,223,252,3,223,192,0,20,0              DG
·3025 DATA 0,20,0,3,149,192,62,149,124,24
2,149,79,63,253,252,3,253,192,0,20,0           ML
·3026 DATA 0,40,0,2,169,192,62,169,124,24
2,169,79,63,255,252,3,255,192,0,40,0           JI
·3027 DATA 0,40,0,2,170,0,42,170,188,162,
170,143,63,255,212,3,255,192,0,40,0            KO
·3058 GOSUB 3985                               GI
·3059 REM ** SPRITE ANIMATION TABLES           DM
·3060 FOR I=38088 TO 38112 STEP 8:FOR J=0
 TO 7:READ A:POKE I+J,A:NEXT:NEXT              MI
·3061 REM ** ANIMATION TABLE DATA              DN
·3062 DATA 24,25,26,27,28,29,30,31             EO
·3063 DATA 32,33,34,35,36,37,38,39             EO
·3064 DATA 27,26,25,24,31,30,29,28             OO
·3065 DATA 37,36,35,34,33,32,39,38             BG
·3098 REM    ***   SPRITE 0 SHAPES   ***       IL
·3099 REM ** SPRITE 0 DIRECTION TABLE          KK
·3100 FOR I=37952 TO 37961:READ A:POKE I,
A:NEXT:GOSUB 3985                              PH
·3101 DATA 16,20,0,22,23,21,0,18,17,19         HA
·3102 REM ** SPRITE 0 ANIMATION TABLE          PB
·3103 FOR I=0 TO 7:POKE 38080+I,16+I:NEXT      PC
·3104 REM ** SPRITE 0 SHAPES                   KN
·3105 FOR I=33792 TO 34240 STEP 64:FOR J=
0 TO 18 STEP 3                                 AD
·3106 READ A:POKE I+J,A:POKE I+J+1,0:POKE
 I+J+2,0:NEXT                                  AM
·3107 FOR J=21 TO 63:POKE I+J,0:NEXT:NEXT
:GOSUB 3985                                    GL
·3109 REM ** SPRITE 0 DATA                     BM
·3110 DATA 8,28,28,28,54,34,0                  EI
·3111 DATA 6,14,28,120,240,48,32               KA
·3112 DATA 0,224,62,31,62,224,0                KN
·3113 DATA 32,48,240,120,28,14,6               OO
·3114 DATA 0,34,54,28,28,28,8                  PK
·3115 DATA 4,12,15,30,56,112,96                LB
·3116 DATA 0,7,124,248,124,7,0                 BK
·3117 DATA 96,112,56,30,15,12,4                GB
·3298 REM ** SPRITE MOVEMENT DATA              GL
·3300 X=0:FOR I=37944 TO 37951:POKE I,X:X
=X+2:NEXT                                      AH
·3305 X=1:FOR I=37962 TO 37976 STEP 2:POK
E I,X:X=X*2:NEXT                               OD
·3310 FOR I=37963 TO 37977 STEP 2:READ A:
POKE I,A:NEXT                                  OL
·3311 DATA 0,5,6,10,9,0,0,0                    MA
·3316 FOR I=37978 TO 37992 STEP 2:READ A:
POKE I,A:NEXT                                  LO
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•3317 DATA 50,43,43,43,43,43,43,43           PI
•3319 FOR I=37979 TO 37993 STEP 2:READ A:
POKE I,A:NEXT                                GK
•3320 DATA 231,242,242,242,242,242,242,24
2                                            BG
•3322 FOR I=37994 TO 38008 STEP 2:READ A:
POKE I,A:NEXT                                ID
•3323 DATA 23,0,0,0,0,0,0,0                  IA
•3325 FOR I=37995 TO 38009 STEP 2:READ A:
POKE I,A:NEXT                                JD
•3326 DATA 80,87,87,87,87,87,87,87           IL
•3328 FOR I=38010 TO 38019:READ A:POKE I,
A:NEXT                                       FD
•3329 DATA 2,1,0,8,10,9,0,4,6,5              LB
•3331 POKE 37934,1                           AH
•3985 PRINT "[RVSON]![RVSOFF]";              NG
•3990 RETURN                                 IM
```

PLANET SETUP

```
•1 REM *** PLANET SETUP ***                  MK
•2 REM MAKES 'GYPSY PLANETS' FOR 'GYPSY'     NO
•5 POKE 53265,PEEK(53265)OR 64               AM
•10 OPEN 2,8,2,"GYPSY PLANETS,SEQ,WRITE"     GM
•14 REM * PLANET NAMES *                     EJ
•15 B$="":B=0:X$=CHR$(13)                    MC
•16 READ A$                                  OJ
•17 IF A$="[5"X"]" THEN PRINT#2,A$:GOTO 5
0                                            JO
•18 GOSUB 45:PRINT#2,A$:PRINT A$             NH
•19 B=B+1:GOTO 16                            DJ
•21 DATA ANDALUSIA,IBERIA,HIBERNIA,CALEDO
NIA,GALES,GAUL,LUSITANIA,ATLANTIS            FC
•22 DATA MISERICORDIA,SALAMANCA,CATALONIA
,LANGUEDOC,NAVARRE,SCANDIA,ULSTER,ZULU       HB
•23 DATA KURDISTAN,ARMENIA,SAMARIA,GALILE
E,SALEM,PLYMOUTH,ERITREA,OGADEN              NJ
•24 DATA HADRAMAWT,SHONA,NDEBELE,UZBEKSKA
YA,BURYAT,KHALKHA,AIMAQ,PRADESH              BC
•25 DATA PANDIT,KALASH KAFIR,BORUSH,SHERP
A,LEPCHA,GURUNG,NEPHILIM,THAI                MJ
•26 DATA PERSIA,BACTRIA,SARDIS,LACONIA,ET
RURIA,DALMATIA,VENETIA,DACIA                 OF
•27 DATA IBANA,MAORI,WIKMUNGKAN,WALBIRI,J
IGALONG,KUKUKUKU,GOILALA,ARAPESH             LC
•28 DATA YAP,FANG,BIAFRA,HAUSA,MALINKE,DO
GON,DRUZIA,SHEBA                             CE
•29 DATA KABAB,HOMR,MYCENAE,KNOSSOS,LATIU
M,BILBAO,CANTABRIA,ROMANY                    NK
•30 DATA BOHEMIA,SILESIA,ESTONIA,LITHUANI
A,FLANDERS,BRETAGNE,ORANGE,QUECHUA           GA
•31 DATA OLMECA,TEOTIHUACAN,TIKAL,TITICAC
A,MACCHU PICCHU,GE,GUARANI,XINGU             PC
•32 DATA BAHIA,AMAHUACA,AYMARA,AINU,YANOM
AMO,OTAVALO,GUAJIRO,KOGI                     OJ
•33 DATA COSTENOGA,CHEROKEE,DAKOTA,HOPI,S
HOSHONE,QAPAW,WACO,KICKAPOO                  FD
•34 DATA WAMPANOAG,CADDO,SHAWNEE,CREEK,AP
ACHE,PUEBLO,NAVAHO,ARAPAHO                   BL
•35 DATA ACADIA,MANCHURIA,TIBET,SHOGUN,HA
KKA,TAIPEI,HUNAN,HMONG                       JO
•36 DATA ROCANNON,ARRAKIS,MEDEA,TERMINUS,
URTH,RAMA,TREASON,WORTHING                   FO
•37 DATA TRONDHEIM,NAUVOO,DESERET,EREWHON
,RIVERWORLD,TROUT,INWIT,DANDELION            FI
•38 DATA WOZNIAK,JOBS,BUSHNELL,TRAMIEL,PO
URNELLE,TURING,ASKY,UNIVAC                   FF
•39 DATA NIVEN,BISHOP,O'NEILL,VARLEY,MART
IN,KESSEL,KILROY,VONNEGUT                    JL
•40 DATA YOLEN,NORTON,BRUMMET,BOVA,ASPRIN
,TURTLEDOVE,RUCKER,LIAVEK                    OP
•41 DATA SWANWICK,SHINER,VAN NAME,WYLDE,F
OWLER,SHEPARD,MEACHAM,SCHIFF                 PI
•42 DATA FERMAN,MOYNIHAN,IACOCCA,MINAS GE
RAIS,MOAB,EDOM,CANAAN,SUMER                  CG
•43 DATA BABYLON,BILOXI,MISHAWAKA,SCHOLZ,
MAYHAR,CARTHAGE,KEIZER,POIUYT,XXXXX          FE
•44 REM CONVERT STRINGS                      NH
•45 D$="":FOR I=1 TO LEN(A$):C$=MID$(A$,I
,1)                                          CD
•46 D$=D$+CHR$(ASC(C$)OR 192):NEXT:A$=D$:
RETURN                                       LA
•49 REM ** WORLD TYPES                       AA
•50 FOR I=0 TO 5:READ A$:PRINT#2,A$:PRINT
 I,A$:NEXT                                   LG
•51 DATA A SPACE STATION,A LARGE MOON,A S
MALL ROCKY PLANET                            AG
•52 DATA UNINHABITED,POPULATED BY HUMANS,
POPULATED BY ALIENS                          LD
•59 REM ** GYPSY NAMES                       PF
•60 FOR K=0 TO 32:READ A$:GOSUB 45:PRINT#
2,A$:PRINT K,A$:NEXT                         BB
•65 DATA RANA,MARA,MISHAK,DOC,GRANNY,VISH
,FINGERS,HOPPER,LOOP,DRAM,HACK,POCK          JP
•66 DATA WILL,ALEC,BOOKER,CLAM,FIZZ,IGOR,
JACQUES,KING,NOOSE,OPAL,QUINK,RABBIT         NI
•67 DATA SHAKER,TOFF,ULLY,YACKITY,ZIPPER,
KAGAN,THUMB,BLADE,GREGORIO                   PH
•98 REM ** UNINHABITED WORLDS                PO
•99 FOR I=0 TO 9:READ A$,B$,C$,D$,E$,F$,G
$:PRINT#2,A$X$B$X$C$X$D$X$E$X$F$X$G$         PO
•100 PRINT I,A$:NEXT                         EI
•101 DATA COLD BARE ROCK WITHOUT WATER OR
 WIND                                        BL
•102 DATA FELL INTO A CREVICE,GOT LOST AN
D FROZE TO DEATH                             NL
•103 DATA SET OFF AN AVALANCHE AND WAS CR
USHED                                        AL
•104 DATA A PURE VEIN OF PLATINUM,A CLIFF
 CARVED WITH AN ALIEN LANGUAGE               MA
•105 DATA THE ORIGINAL VOYAGER SPACECRAFT    OM
•106 DATA A THICK IMPENETRABLE LAYER OF V
INES AND FERNS                               IC
•107 DATA WAS DEVOURED BY A MAN-EATING PL
ANT,SANK INTO A HIDDEN BOG                   HM
•108 DATA DIED OF VIOLENT ALLERGIES TO PO
LLEN                                         GJ
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•109 DATA A VINE THAT BEARS HIGH-CALORY F
RUIT,SAP THAT HARDENS INTO JEWELS       PA
•110 DATA AN INSECT WHOSE BITE CURES CANC
ER                                      KO
•111 DATA A MILE-THICK LAYER OF DUST    HI
•112 DATA SANK INTO THE DUST AND DISAPPEA
RED,CHOKED TO DEATH IN THE WIND         HP
•113 DATA WAS EATEN BY A HUGE DUSTWORM,A
PATCH OF EUPHORIA-CAUSING DUST          DB
•114 DATA A NEW SPECIES OF OXYGEN-MAKING
MICROBE,DIAMONDS EXCRETED BY DUSTWORMS  EG
•116 DATA A SURFACE ENTIRELY ENCRUSTED WI
TH      DAZZLING CRYSTALS               MM
•117 DATA FELL AND WAS CUT TO RIBBONS,WAS
 CRUSTED OVER WITH CRYSTALS             LO
•118 DATA WENT MAD FROM THE PATTERNS OF L
IGHT                                    IK
•119 DATA CRYSTALS THAT HOLD MEGABYTES OF
 MEMORY                                 CN
•120 DATA LIVING CRYSTALS THAT PAINT WITH
 PURE    LIGHT,HUGE EMERALDS            KC
•121 DATA THE HIGHLY RADIOACTIVE HUSK OF
A WORLD  THAT DIED IN NUCLEAR WAR       JN
•122 DATA DIED OF RADIATION POISONING,WAS
 KILLED BY A MUTATED VIRUS              JK
•123 DATA TRIGGERED AN ANCIENT LANDMINE,A
 SCULPTURE OF INEFFABLE BEAUTY          GN
•124 DATA THE HISTORY OF A LOST CIVILIZAT
ION,A MUTATED SPECIES OF SENTIENT RAT   FJ
•126 DATA THE DUSTY RUINS OF A SPECIES TH
AT LEFT  TO VOYAGE AMONG THE STARS      ME
•127 DATA ATE A FRUIT THAT CAUSED FATAL D
YSENTERY,WAS KILLED BY A CRAZED ROBOT   EI
•128 DATA FELL INTO A DISINTEGRATOR UNIT,
A MATTER-DESTROYING DISINTEGRATOR       ON
•129 DATA THE SECRET OF INSTANT MATTER TR
ANSFER,A GALLERY OF PRICELESS PAINTINGS FJ
•131 DATA A VAST OCEAN WITHOUT A SPECK  O
F LAND                                  GD
•132 DATA WAS PULLED INTO THE SEA BY A HU
GE SQUID,DRANK THE WATER AND DIED       GO
•133 DATA WAS COVERED BY A HIDEOUS ALGAE
AND DRIEDUP IN MOMENTS                  EB
•134 DATA SWIMMING OYSTERS WITH GIANT PEA
RLS,IVORY TUSKS FROM DEAD NARWHALS      EK
•135 DATA A SPECIES OF GRAIN THAT GROWS I
N SALT   WATER                          AM
•136 DATA A SURFACE RAVAGED BY VIOLENT ST
ORMS AND SMOTHERING BLIZZARDS           FN
•137 DATA WAS CARRIED OFF BY THE WIND,WAS
 BURIED IN A SNOWDRIFT                  MF
•138 DATA WAS GROUND TO POWDER IN A SANDS
TORM,THE LOG OF THE LOST SHIP ENTERPRISE DB
•139 DATA A TREE WITH WOOD TOUGHER THAN S
TEEL,A PLANT THAT SYNTHESIZES HYDROGEN  NA
•141 DATA A YOUNG PLANET WITH CONSTANT VO
LCANOES  AND EARTHQUAKES                GO
•142 DATA WAS CAUGHT IN LAVA,FELL INTO A
GEYSER,CHOKED TO DEATH ON FLYING ASH    FF
•143 DATA A RIVER OF PURE PLATINUM,THE OL
DEST METEORITE EVER FOUND               GN
•144 DATA A POOL OF SELF-REPLICATING PROT
EINS--THEBEGINNINGS OF LIFE!            GP
•146 DATA A GLASS-SMOOTH SURFACE COVERED
WITH THE WRECKS OF OLD STARSHIPS        DI
•147 DATA SANK INTO THE SURFACE AND VANIS
HED,WAS SUCKED INTO A TINY BLACK HOLE   MN
•148 DATA GREW SMALLER AND SMALLER--AND F
INALLY   DISAPPEARED                    KB
•149 DATA SMALL SINGULARITIES THAT ALLOW
TIME     TRAVEL                         AC
•150 DATA GOLD FROM AN ANCIENT CARGO SHIP
,A RADIATION-SUPPRESSION FIELD          OJ
•198 REM ** WORLDS POPULATED BY HUMANS  AN
•199 FOR I=0 TO 9:READ A$,B$,C$,D$,E$,F$,
G$:PRINT#2,A$X$B$X$C$X$D$X$E$X$F$X$G$   PO
•200 PRINT I,A$:NEXT                    EI
•201 DATA A TRIBE OF PRIMITIVE HUNTERS AN
D FRUIT- GATHERERS                      KF
•202 DATA WANDERED OFF AND WAS EATEN,OFFE
NDED THE CHIEF AND WAS KILLED           HM
•203 DATA GOT FLEAS THAT CARRIED A DEADLY
 DISEASE                                OB
•204 DATA IVORY,PELTS,ANTHROPOLOGICAL DAT
A                                       PN
•206 DATA A FARMING VILLAGE WHOSE PEOPLE
SCRATCH  THE SOIL WITH STONE TOOLS      GG
•207 DATA GOT ROMANTICALLY INVOLVED AND W
AS KILLEDBY A FURIOUS FATHER            PI
•208 DATA GOT IN A QUARREL AND WAS MASHED
 WITH A  STONE AX,CAUGHT A POX AND DIED JA
•209 DATA A DOMESTICATED FLYING LIZARD,PR
IMITIVE BUT LOVELY POTS,OPALS           AC
•211 DATA A BRONZE-USING CIVILIZATION THA
T BUILDS HUGE STONE MONUMENTS           IK
•212 DATA WAS SACRIFICED TO A RAIN GOD,WA
S CRUSHED UNDER A BLOCK OF STONE        NC
•213 DATA INSULTED A PRIEST AND WAS POISO
NED,MAGNIFICENT STONE SCULPTURES        EI
•214 DATA A SOFT AND BEAUTIFUL METAL ALLO
Y,GILT DAGGERS OF CUNNING ARTIFICE      CP
•216 DATA A COASTAL VILLAGE OF SEA-FARING
 TRADERS                                BD
•217 DATA WAS CARRIED OFF INTO SLAVERY,WA
S THROWN OVERBOARD                      MJ
•218 DATA WAS CAUGHT 'BORROWING' A JEWEL
AND WAS  TORTURED TO DEATH              LO
•219 DATA A SNAKE WHOSE VENOM IS SUBTLE A
ND STRONG,A SPECIES OF SUCCULENT FISH   LE
•220 DATA BEAUTIFULLY DECORATED HARPOONS
AND FISH KNIVES                         PN
•221 DATA A PEOPLE WHO DWELL IN A VAST NE
TWORK OF CAVERNS AND BURROWS            HL
•222 DATA WAS BURIED IN THE COLLAPSE OF A
 TUNNEL,ATE A POISONOUS MUSHROOM        DG
•223 DATA GOT LOST FOREVER IN A LABYRINTH
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,AN EXQUISITELY FLAVORFUL MOLD                AD
•224 DATA A BRIGHTLY LUMINOUS FISH,THE LA
RGEST EMERALDS EVER FOUND                     KH
•226 DATA A HUGE CITY HOUSED IN A SINGLE
MILE-HIGHBUILDING                             IO
•227 DATA FELL (OR WAS PUSHED) FROM A BAL
CONY,ARGUED WITH A COP AND WAS SHOT           JD
•228 DATA WAS RUN OVER BY A CORRIDOR-TAXI
,HIGH-POWERED ROLLER SKATES                   NJ
•229 DATA AN APHRODISIAC THAT WORKS,A PIV
OTAL NEW BOOK ON PSYCHOLOGY                   HA
•231 DATA A PEOPLE WHO LIVE IN THE TOPS O
F HUGE    DECIDUOUS TREES                     OO
•232 DATA STUMBLED ON A HIGH BRANCH,WAS E
ATEN BY A CARNIVOROUS SLOTH                   LK
•233 DATA WAS KIDNAPPED AND VIVISECTED,TH
E SEEDS OF A SPECIES OF SENTIENT TREE         GC
•234 DATA A MOSS THAT SYNTHESIZES HELIUM-
-AND FLOATS                                   EI
•235 DATA AN ALGAE THAT SERVES AS A FAST
AND       POWERFUL COMPUTER                   OJ
•236 DATA A WHOLE TOWN LIVING IN A HUGE B
ASKET     SLUNG UNDER A VAST BALLOON          HP
•237 DATA LIT A MATCH AND WAS IMMEDIATELY
 PUSHED OFF,WAS CARRIED OFF BY A ROC          ON
•238 DATA WAS EATEN BY ONE OF THE HUGE CA
RNIVORES ON THE SURFACE                       AI
•239 DATA A PLANT THAT TURNS SUNLIGHT INT
O USABLE HEAT,A DOMESTICATED BAT              IP
•240 DATA CLEVERLY ENGINEERED WINGS THAT
ALLOW     HUMANS TO FLY                       CG
•241 DATA A FAMILY OF DRAGON BREEDERS WHO
 WAGER ONTHE VICIOUS WYRMFIGHTS               OK
•242 DATA CAUGHT A DRAGON'S EYE AND BECAM
E LUNCH,WAS KILLED OVER A WYRMFIGHT BET       KG
•243 DATA WAS FORCED TO MARRY A LOCAL AND
 STAY ON THIS WORLD                           OI
•244 DATA DRAGONS' EGGS,HALLUCINOGENIC DR
AGONS'    DUNG                                OF
•245 DATA A SMALL DRAGON PARASITE THAT CA
USES LOSTLIMBS TO REGENERATE                  MN
•246 DATA A TRIBE OF HORSEMEN WHO TEND VA
ST HERDS OF WOOLLY MAMMOTHS                   AO
•247 DATA WAS TRAMPLED IN A STAMPEDE,ANNO
YED A NATIVE WITH A BLOWGUN                   EB
•248 DATA STOOD TOO NEAR A FLATULENT MAMM
OTH AND   SUFFOCATED                          OF
•249 DATA MAMMOTH IVORY,CHEESE MADE FROM
MAMMOTH MILK                                  HG
•250 DATA "A BREED OF SMALL, TOUGH, FAST,
 AND[6" "]ALMOST SENTIENT HORSES"             FK
•298 REM ** WORLDS POPULATED BY ALIENS        PD
•299 FOR I=0 TO 9:READ A$,B$,C$,D$,E$,F$,
G$:PRINT#2,A$X$B$X$C$X$D$X$E$X$F$X$G$         PO
•300 PRINT I,A$:NEXT                          EI
•301 DATA A RACE OF SENTIENT SQUIDS THAT
TEND      GARDENS UNDER THE SEA               MA
•302 DATA BROKE AN AIRHOSE AND DROWNED,WA
S HYPNOTIZED AND LURED INTO OPEN JAWS         NA
•303 DATA TOOK A SAMPLE OF CORAL THAT TUR
NED OUT  TO BE SACRED                         FC
•304 DATA EXQUISITE BANSAI CORAL,PET SEAW
EED THAT DOES TRICKS,SEABOTTOM SALMON         AM
•305 DATA CREATURES OF PURE MIND THAT DWE
LL BY     POOLS AND STREAMS                   NH
•306 DATA DIED TRYING TO SEPARATE BODY FR
OM MIND,BECAME DEPRESSED AND CATATONIC        AB
•307 DATA WENT MAD FROM DREDGED-UP MEMORI
ES OF     PAST CRIMES                         HD
•308 DATA PROOF OF UNPROVABLE MATHEMATICA
L         PROPOSITIONS                        LF
•309 DATA THE SECRET OF FOLDED SPACE,A CO
MPLETE    MAP OF THE UNIVERSE                 PC
•310 DATA MONKEYISH TREE-DWELLERS THAT LI
VE ONLY   TO SING IN THE TREETOPS             FA
•311 DATA DIDN'T WEAR EARPLUGS AND WAS EN
RAPTURED BY SONG--FORGETTING TO BREATHE       GG
•312 DATA TRIED TO SING A DUET AND WAS PE
LTED TO   DEATH WITH FRUIT                    JL
•313 DATA ATE A TREE SLUG THAT REGENERATE
D 1000    TIMES INTERNALLY                    FK
•314 DATA RECORDINGS OF SONGS,AN ADVENTUR
OUS YOUNGSINGER OF SURPASSING TALENT          AP
•315 DATA AN 'UNSONG BIRD' THAT GENERATES
 A FIELD OF SILENCE WHEREVER IT GOES          KI
•316 DATA ON A PLANET OF DINOSAURS--A RAC
E OF WISEBIRDS THAT NEVER LAND                AI
•317 DATA WAS STEPPED ON BY A BRONTOSAURU
S,FELL INTO A BOG AND BECAME A FOSSIL         MG
•318 DATA TRIED TO STEAL AN EGG AND WAS P
ICKED UP AND DROPPED                          JJ
•319 DATA MIDGET HADRODONS THAT MAKE GREA
T PETS,PERFUME-EMITTING DRAGONFLIES           AN
•320 DATA XENOLOGICALLY FASCINATING FILMS
 OF MID- AIR REPRODUCTION                     IE
•321 DATA CREATURES THAT LIVE BY CREATING
 ILLUSIONIN THE MINDS OF THEIR PREY           KP
•322 DATA TRIED TO CROSS AN IMAGINARY BRI
DGE,WAS CAUGHT CHEATING AT POKER              KO
•323 DATA DID MAGIC TRICKS THE ALIENS COU
LDN'T DO AND WAS TAKEN PRISONER               GK
•324 DATA PERMANENT ILLUSIONS TIED TO SMA
LL JEWELS,A FAST-GROWING LEGUME               EM
•325 DATA A FERRET THAT IS INVARIABLY DRA
WN TO     HIGH INTELLIGENCE                   DH
•326 DATA A RACE OF SHAPECHANGERS WHO HAV
E         FORGOTTEN THEIR 'REAL' SHAPE        CP
•327 DATA WAS SHOT BY A GYPSY WHO THOUGHT
 IT WAS   AN IMPOSTOR,GOT A FATAL ILLNESS     CA
•328 DATA WENT HUNTING AND BAGGED THE WRO
NG PREY,A NET-SPINNING TREE                   PN
•329 DATA SHAPE-CHANGING PROTOPLASM,OZONE
-EMITTING AIRBORNE SLIME                      AA
•330 DATA CLUMSY GRASS-EATING BEHEMOTHS I
NFESTED   BY SENTIENT BLOODSUCKERS            DF
•331 DATA WAS TAKEN OVER BY A SUCKER,WAS
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TRAMPLED BY AN ANGRY HERD                HP
•332 DATA SAID SOMETHING SLANDEROUS ABOUT
 THE      SUCKERS,SWEET-SMELLING DUNG    CM
•333 DATA AN INTELLIGENCE-ENHANCING DISTI
LLATION  OF SUCKER HORMONES              IA
•334 DATA A SUCKER-EATING BAT            HD
•335 DATA TREES THAT GROW CLONES OF ANY C
REATURE  AS THEIR FRUIT                  AI
•336 DATA WAS DEVOURED AND CLONED 500 TIM
ES TO    FORM A VILLAGE                  DA
•337 DATA CLIMBED A HUNGRY TREE,CHOPPED D
OWN THE CHIEF'S DAUGHTER FOR   FIREWOOD  GD
•338 DATA A SEEDLING OF A TREE THAT COULD
 CLONE   THE DEAD                        HH
•339 DATA A FIBROUS PLANT WITH STEEL-LIKE
 THREADS,A FIRE-BREATHING MOUSE          CJ
•340 DATA A RACE OF CATS THAT KEEP DOGS A
ND MICE  AS SLAVES--WHILE RATS REBEL     OP
•341 DATA WAS LOBOTOMIZED AND TRAINED TO
FETCH FORTHE KING OF CATS                EF
•342 DATA TRIED TO PET A DOG-SOLDIER,WAS
CARRIED OFF IN THE NIGHT BY A RAT PACK   AJ
•343 DATA A DOG THAT CAN REPEAT HOURS OF
CONVERSA-TION WORD FOR WORD              MP
•344 DATA MICE TRAINED AS HAIRDRESSERS,PL
ANS FOR CATS TO TAKE OVER THE UNIVERSE   ME
•345 DATA ROBOTS THAT EVOLVED FROM AN ANC
IENT STARSHIP SERVICE STATION            MC
•346 DATA WAS CAUGHT WITH A DATA-ERASING
MAGNETIC DEVICE                          GJ
•347 DATA WAS MISTAKENLY LUBRICATED BY A
REPAIRBOT,BEAT THE WRONG ROBOT AT CHESS  LB
•348 DATA ORGANICALLY-GROWN POSITRONIC BR
AINS,A METAL-PRESERVING FUNGUS           DF
•349 DATA FLEA-SIZED SELF-REPLICATING REP
AIRBOTS                                  NB
•990 CLOSE 2                             NC
•1000 END                                IC
```

GYPSY

```
•1 REM      ***  GYPSY  ***              DI
•2 REM FILES 'GYPSY VIDEO' AND 'GYPSY PLA
NETS' MUST BE ON DISK!                   GJ
•3 REM USE 'VIDEO SETUP' AND 'PLANET SETU
P' TO CREATE THESE FILES                 MF
•5 POKE 55,255:POKE 56,127:POKE 643,255:P
OKE 644,127:CLR                          DN
•6 REM (TYPING THIS PROGRAM IS EASIER IF
YOU GOSUB 95 IN DIRECT MODE RIGHT AWAY)  LB
•7 F$=" ":C0%=0:C1%=0:C2%=0:C3%=0:C4%=0:C
5%=0:C6%=0:SP%=0                         NO
•8 IF PEEK(37952)<>16 OR PEEK(37953)<>20
THEN 2000                                MF
•9 DIM VV$(24)                           BI
•10 GOSUB 700:GOSUB 2100                 KG
•12 GOSUB 90:GOSUB 600:PRINT "[CLEAR]";:G
OSUB 95:GOSUB 900:L=FRE(9)               JB
•13 PRINT VV$(23)"[RVSOFF][40" "]";      KH
•14 SYS 38046:POKE 648,140:PRINT VV$(23)B
B$BB$"[13" "]";                          MA
•15 GOSUB 260:POKE 33767,32              LH
•16 FOR I=0 TO 63:POKE 35840+I,0:NEXT:POK
E ES,31                                  HJ
•17 GOTO 100                             CF
•39 REM READ JOYSTICK                    DN
•40 JY=255-PEEK(56320):JB=JY AND 16      PP
•41 JY=JY AND 15:IF JY=0 AND JB=0 THEN 40 OF
•42 RETURN                               IM
•50 I=INT(RND(0)*I):RETURN               BO
•55 FOR I=19 TO 23:PRINT VV$(I)"[40" "]";
:NEXT                                    BH
•56 PRINT VV$(19);:RETURN                CC
•60 C4%=0:FM=FM-1:IF FM>0 THEN RETURN    CA
•62 FM=TS/2:QF=QF-1:IF QF=0 THEN PRINT VV
$(23)BB$;:RETURN                         DH
•64 PRINT VV$(23)BB$VV$(23)LEFT$(FF$,QF);
:RETURN                                  CO
•70 TM=TS:QS=QS-1:IF QS=0 THEN PRINT VV$(
24)BB$;:RETURN                           EF
•72 PRINT VV$(24)BB$VV$(24)LEFT$(SS$,QS);
:RETURN                                  CJ
•90 POKE 53265,0:RETURN                  MO
•95 POKE 53265,91:RETURN                 PH
•98 REM      *** ACTION LOOP ***         KJ
•100 TM=TM-1:IF TM<1 THEN GOSUB 70:IF QS<
1 THEN 275                               MI
•105 IF C4%>0 THEN GOSUB 60:IF QF<1 THEN
270                                      EL
•110 IF C4%>0 AND C5%>0 THEN GOSUB 200   BF
•120 C0%=0:C5%=0                         DO
•130 IF SP%>0 THEN 280                   HF
•196 GOTO 100                            CF
•200 I=C5%:C5%=0:C4%=0:J=I AND 10:K=I AND
 20                                      KE
•201 WP=1:IF I>2 THEN WP=2:IF I>4 THEN WP
=3:IF I>8 THEN WP=4                      HM
•204 IF C0%>0 THEN 230                   EM
•205 IF J>0 THEN 220                     PK
•210 QF=QF+LV:IF QF>33 THEN QF=33        LN
•215 PRINT VV$(23)LEFT$(FF$,QF);:RETURN  NF
•220 IF QS<17 THEN QS=QS+LV:IF QS>17 THEN
 QS=17                                   GH
•225 PRINT VV$(24)LEFT$(SS$,QS);:RETURN  JB
•230 ON WP GOTO 400,240,400,240:RETURN   IL
•240 IF RP(WP)>0 THEN 400                FJ
•245 PRINT VV$(23)BB$VV$(23)"[s S][s O][s
 R][s R][s Y][c Z][c Z][s N][s O][SS][s
 S][s U][s R][s F][s A][s C][s E][SS][s F
 ][s O][s R][SS][s L][s A][s N][s D][s I]
 [s N][s G]";:GOSUB 800                  KL
•250 PRINT VV$(24)BB$VV$(24)"[RVSON]PRESS
 BUTTON TO GO ON";:C0%=0                 KO
•255 IF C0%=0 THEN 255                   GC
•256 IF C0%=1 THEN C0%=0:GOTO 256        JJ
•260 PRINT VV$(23)BB$VV$(24)BB$;         PH
•265 PRINT VV$(23)LEFT$(FF$,QF)VV$(24)LEF
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T$(SS$,QS);:RETURN                                    MD
•270 PRINT VV$(23)"[RVSON][s O][s U][s T]
[SS][s O][s F][SS][s F][s U][s E][s L][R
VSOFF]";:FOR I=0 TO 1999:NEXT:GOTO 280     JB
•275 PRINT VV$(24)"[RVSON][s O][s U][s T]
[SS][s O][s F][SS][s A][s I][s R][RVSOFF
]";:FOR I=0 TO 1999:NEXT                    LO
•280 SP%=0:GOSUB 90:POKE ES,0:SYS 40768    CC
•281 POKE 56578,PEEK(56578)OR3:POKE 56576
,(PEEK(56576)AND 252)OR 3                   MB
•282 POKE 53272,20:POKE 648,4:PRINT "[CLE
AR]";                                       MC
•283 GOSUB 95:PRINT " "GB$" HAS REMOVED Y
OU AS PILOT.":I=LEN(GL$):GOSUB 50           FL
•284 PRINT:PRINT " WITH LUCK, "GN$(I)" CA
N PILOT"                                    JM
•285 PRINT " THE FAMILY TO FORTUNE--AND S
URVIVAL!";                                  JL
•286 PRINT VV$(24)"[RVSON][s P][s R][s E]
[s S][s S][SS][s B][s U][s T][s T][s O][
s N][SS][s T][s O][SS][s C][s O][s N][s
T][s I][s N][s U][s E][RVSOFF]";           OB
•287 GOSUB 40:IF JB=0 THEN 287              IE
•295 GOTO 300                               BP
•300 PRINT "[CLEAR]"VV$(10)"[6"[SS]"][s P
][s L][s A][s Y][SS][s A][s G][s A][s I]
[s N][c B]"VV$(12)"[6"[SS]"][s Q][s U][s
 I][s T][c B][6"[SS]"]";                   NG
•305 PRINT VV$(2)"[RVSON]CARGO VALUE[5" "
][RVSOFF][EP]"STR$(CV*10000)                HC
•306 PRINT VV$(4)"[RVSON]SURVIVING CREW
[RVSOFF] "STR$(LEN(GL$))                    EL
•307 LV=10:XV=10:FOR I=0 TO 599:NEXT        AJ
•308 PRINT VV$(XV)RX$VV$(LV)"[RVSON][c Z]
[RVSOFF]":XV=LV                             KH
•309 GOSUB 40:IF JB>0 THEN 315              GP
•310 IF(JY<>1)AND(JY<>2) THEN 309           NB
•311 IF LV=10 THEN LV=12:GOTO 308           OG
•312 LV=10:GOTO 308                         BN
•315 IF LV=12 THEN 370                      JB
•320 GL$=LEFT$(PZ$,33):PY$=LEFT$(PZ$,TN)    ID
•321 GB=INT(RND(0)*33):GB$=GN$(GB):I=GB:G
OSUB 875:PV=0                               CH
•330 GOSUB 700                              CH
•335 GOTO 12                                PF
•370 PRINT VV$(24)"[RVSON]TILL NEXT TIME,
 GYPSY PILOT[RVSOFF]";:FOR I=0 TO 1999:N
EXT                                         IM
•379 REM ** REENABLE SHIFT/COMMODORE AND
RUN-STOP/RESTORE                            FB
•380 POKE 657,0:POKE 792,71:POKE 808,237    PK
•390 SYS 65126                              KI
•400 QS=33:PRINT VV$(24)LEFT$(SS$,QS);:PO
KE ES,0:SYS 40768                           EK
•401 VT(WP)=1:DG$=LEFT$(PZ$,3):TR$=LEFT$(
PZ$,HT(WP)):FT=0                            HM
•405 POKE 56578,PEEK(56578)OR3:POKE 56576
,(PEEK(56576)AND 252)OR 3                   MB
•410 POKE 53272,20:POKE 648,4               OM
•415 PRINT "[CLEAR][RVSOFF]";:GOSUB 95      IA
•416 PRINT " YOU HAVE LANDED A GROUP OF G
YPSIES ON"                                  NE
•417 PRINT " "MM$(0,2-RP(WP));:IF PN(WP)<
254 THEN PRINT " NAMED "NM$(PN(WP))         MN
•418 PRINT VV$(2)" (IT IS "MM$(1,HB(WP))"
)"                                          PL
•419 PRINT VV$(4)" YOUR FIRST REPORT TO T
HE SHIP NOTES:"                             CN
•420 PRINT "[RVSON]"VV$(5)PM$(PD(WP),HB(W
P))VV$(8)"[RVSON][s W][s H][s A][s T][SS
][s W][s I][s L][s L][SS][s Y][s O][s U]
[SS][s D][s O][SS][s N][s O][s W][c B][R
VSOFF]";                                    LH
•421 ON HB(WP) GOTO 500,500                 AL
•422 PRINT "[BLUE]"VV$(9)"[SS][SS][s L][s
 O][s O][s K][SS][s A][s R][s O][s U][s
N][s D]"VV$(10)"[SS][SS][s T][s A][s K][
s E][SS][s W][s H][s A][s T][SS][s W][s
E][SS][s N][s E][s E][s D]";               KP
•423 PRINT VV$(11)"[SS][SS][s G][s E][s T
][SS][s B][s A][s C][s K][SS][s T][s O][
SS][s T][s H][s E][SS][s S][s H][s I][s
P]"VV$(12)"[SS][SS][s R][s E][s S][s I][
s G][s N][SS][s A][s S][SS][s P][s I][s
L][s O][s T][c 7]";                        FJ
•424 K=9:L=K                                NM
•425 PRINT VV$(L)RX$VV$(K)RR$;:L=K          IP
•426 GOSUB 40:IF JB>0 THEN 431              IC
•427 IF JY=1 THEN K=K-1:IF K<9 THEN K=12    NH
•428 IF JY=2 THEN K=K+1:IF K>12 THEN K=9    KF
•429 IF K=L THEN 426                        CM
•430 GOTO 425                               CN
•431 PRINT VV$(L)RX$;:ON K-8 GOTO 432,435
,480,470                                    MC
•432 I=DL(WP):GOSUB 50:IF I<3 THEN 440      CM
•433 I=EF(WP):GOSUB 50:IF I<3 AND LEN(TR$
)>0 THEN 450                                AG
•434 GOSUB 55:PRINT "[SS][s F][s O][s U][
s N][s D][SS][s N][s O][s T][s H][s I][s
 N][s G][SS][s W][s O][s R][s T][s H][s
W][s H][s I][s L][s E][SS]";:GOTO 424      HF
•435 IF FT>0 THEN GOSUB 55:PRINT "[SS][s
G][s O][s T][SS][s I][s T][c K][SS]";:CV
=CV+FT:FT=0:GOTO 424                        KP
•436 I=DL(WP):GOSUB 50:IF I<3 THEN 440      CM
•437 GOSUB 55:PRINT "[SS][s W][s H][s A][
s T][c M][s S][SS][s T][s O][SS][s T][s
A][s K][s E][c B][SS]";:GOTO 424           DL
•440 GOSUB 55:PRINT "[RVSON] PILOT!  IT'S
 AWFUL!  ";                                 JP
•441 I=LEN(GL$):GOSUB 50:PRINT GN$(I)" JU
ST"                                         OG
•442 GOSUB 875:IF LEN(GL$)<5 THEN SP%=1:P
RINT VV$(23)" TOO MANY LOST, PILOT!";      JA
•443 PRINT AM$(PD(WP),HB(WP),ASC(LEFT$(DG
$,1)),0)"[RVSOFF]";                        PB
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•444 I=LEN(DG$):IF I<2 THEN 446             CK
•445 DG$=RIGHT$(DG$,I-1):ON HB(WP) GOTO 5
 07,507:GOTO 424                            HP
•446 PRINT VV$(24)"[SS][s P][s R][s E][s
 S][s S][SS][s B][s U][s T][s T][s O][s N
 ][SS][s T][s O][SS][s C][s O][s N][s T][
 s I][s N][s U][s E][SS]";                  LG
•447 GOSUB 40:IF JB=0 THEN 447              GK
•448 PRINT VV$(18)GN$(GB)" ORDERS YOU: RE
 TURN TO THE SHIP!";                        HD
•449 GOTO 480                               CI
•450 GOSUB 55:PRINT "[RVSON][SS][s P][s I
 ][s L][s O][s T][c K][SS][SS][s L][s O][
 s O][s K][SS][s W][s H][s A][s T][SS][s
 W][s E][SS][s F][s O][s U][s N][s D][c K
 ][SS][SS]"                                 GA
•451 PRINT AM$(PD(WP),HB(WP),ASC(LEFT$(TR
 $,1)),1)"[RVSOFF]";                        PB
•452 I=10:GOSUB 50:FT=1+(I*LV):I=12-DL(WP
 ):IF I<1 THEN 454                          DK
•453 GOSUB 50:FT=FT-I                       DP
•454 IF FT=0 THEN FT=1                      DP
•455 I=LEN(TR$):IF I=1 THEN TR$="":GOTO 4
 57                                         MM
•456 TR$=RIGHT$(TR$,I-1)                    MB
•457 ON HB(WP) GOTO 507,507:GOTO 424        HO
•470 SP%=1:GOSUB 90:GOTO 490                FF
•480 GOSUB 55                               PK
•481 PRINT "[RVSON][s S][s U][s R][s V][s
 I][s V][s I][s N][s G][SS][s C][s R][s
 E][s W][SS][SS]"LEN(GL$)VV$(20)"[s C][s
 A][s R][s G][s O][SS][s V][s A][s L][s U
 ][s E][4"[SS]"][c -]"CV*10000              DI
•482 PRINT VV$(24)"[RVSON][SS][s P][s R][
 s E][s S][s S][SS][s B][s U][s T][s T][s
 O][s N][SS][s T][s O][SS][s C][s O][s N
 ][s T][s I][s N][s U][s E][SS][RVSOFF]"; PI
•483 FOR I=0 TO 599:NEXT                    MF
•484 GOSUB 40:IF JB=0 THEN 484              IB
•490 GOSUB 800                              CI
•491 IF(PEEK(52)-PEEK(50))<4 THEN L=FRE(9
 )                                          AO
•495 GOSUB 600:SYS 38046:POKE 648,140:POK
 E ES,31                                    AE
•496 RETURN                                 IM
•500 PRINT "[BLUE]"VV$(9)"[SS][SS][s L][s
 O][s O][s K][SS][s A][s R][s O][s U][s
 N][s D]"VV$(10)"[SS][SS][s A][s S][s K][
 SS][s Q][s U][s E][s S][s T][s I][s O][s
 N][s S]";                                  GK
•501 PRINT VV$(11)"[SS][SS][s P][s U][s T
 ][SS][s O][s N][SS][s A][SS][s S][s H][s
 O][s W]"VV$(12)"[SS][SS][s O][s F][s F]
 [s E][s R][SS][s T][s O][SS][s T][s I][s
 N][s K][s E][s R]";                        MI
•502 PRINT VV$(13)"[SS][SS][s D][s I][s C
 ][s K][s E][s R][SS][s W][s I][s T][s H]
 [SS][s T][s H][s E][SS][s L][s O][s C][s
 A][s L][s S]"VV$(14)"[SS][SS][s A][s S]
 [s K][SS][s F][s O][s R][SS][s H][s E][s
 L][s P]";                                  NL
•503 PRINT VV$(15)"[SS][SS][s T][s A][s K
 ][s E][SS][s W][s H][s A][s T][SS][s W][
 s E][SS][s N][s E][s E][s D]"VV$(16)"[SS
 ][SS][s G][s E][s T][SS][s B][s A][s C][
 s K][SS][s T][s O][SS][s T][s H][s E][SS
 ][s S][s H][s I][s P]";                    AL
•504 PRINT VV$(17)"[SS][SS][s R][s E][s S
 ][s I][s G][s N][SS][s A][s S][SS][s P][
 s I][s L][s O][s T][c 7]";                 ED
•507 K=9:L=K                                NM
•508 PRINT VV$(L)RX$VV$(K)RR$;:L=K          IP
•509 GOSUB 40:IF JB>0 THEN 515              IB
•510 IF JY=1 THEN K=K-1:IF K<9 THEN K=17    NK
•511 IF JY=2 THEN K=K+1:IF K>17 THEN K=9    KA
•512 IF K=L THEN 509                        DA
•513 GOTO 508                               DB
•515 PRINT VV$(L)RX$;:ON K-8 GOTO 520,530
 ,540,550,560,570,580,480,470               HJ
•520 I=DL(WP):GOSUB 50:IF I<3 THEN 440      CM
•521 I=EF(WP):GOSUB 50:IF I<3 AND LEN(TR$
 )>0 THEN 450                               AG
•522 GOSUB 55:PRINT "[SS][s F][s O][s U][
 s N][s D][SS][s N][s O][s T][s H][s I][s
 N][s G][SS][s W][s O][s R][s T][s H][s
 W][s H][s I][s L][s E][SS]";:GOTO 507      HF
•529 GOTO 507                               CO
•530 IF HB(WP)<>1 THEN 532                  AB
•531 IF DL(WP)<5 THEN DL(WP)=3:GOSUB 55:P
 RINT "[c I][s G][s O][SS][s A][s W][s A]
 [s Y][c I]";:GOTO 507                      DJ
•532 IF DL(WP)>7 AND LEN(TR$)>0 THEN 450    DN
•533 GOSUB 55:IF HB(WP)=1 THEN PRINT "[c
 I][s S][s O][s R][s R][s Y][c Z][c Z][s
 C][s A][s N][c M][s T][SS][s H][s E][s L
 ][s P][SS][s Y][s O][s U][c I]";:GOTO 50
 7                                          EJ
•534 PRINT "[c I][s N][s O][SS][s S][s P]
 [s E][s A][s K][SS][s G][s A][s L][s A][
 s C][s T][s I][s C][SS][s L][s A][s N][s
 G][s U][s A][s G][s E][SS][s S][s O][SS
 ][s S][s O][s R][s R][s Y][c I]";:GOTO 5
 07                                         IB
•540 IF DL(WP)<7 THEN DL(WP)=DL(WP)+1:GOT
 O 542                                      AN
•541 GOSUB 55:PRINT "[SS][s T][s H][s E][
 SS][s Y][s O][s K][s E][s L][s S][SS][s
 D][s O][s N][c M][s T][SS][s A][s P][s P
 ][s R][s E][s C][s I][s A][s T][s E][SS]
 [s A][s R][s T][SS]";:GOTO 507             IH
•542 GOSUB 55:PRINT "[SS][s H][s E][s A][
 s R][SS][s T][s H][s E][SS][s A][s P][s
 P][s L][s A][s U][s S][s E][c B][SS][SS]
 [s T][s H][s E][s Y][SS][s L][s O][s V][
 s E][SS][s U][s S][c K][SS]";:GOTO 507     BH
•550 IF HB(WP)=1 THEN I=DL(WP):GOSUB 50:I
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F I<3 THEN DL(WP)=DL(WP)+1:GOTO 552 FC
•551 GOSUB 55:PRINT "[SS][s T][s H][s E][
s Y][c M][s V][s E][SS][s G][s O][s T][S
S][s N][s O][s T][s H][s I][s N][s G][SS
][s F][s O][s R][SS][s U][s S][SS][s T][
s O][SS][s F][s I][s X][SS]";:GOTO 507 MN
•552 GOSUB 55:PRINT "[SS][s T][s H][s E][
s Y][SS][s L][s I][s K][s E][s D][SS][s
O][s U][s R][SS][s W][s O][s R][s K][c D
][SS][s P][s I][s L][s O][s T][SS]"; DI
•553 IF EF(WP)>4 THEN EF(WP)=EF(WP)-1 HC
•554 GOTO 507 CO
•560 IF FT<>0 THEN 563 PK
•561 IF (DL(WP)>6)AND(EF(WP)<10)AND LEN(T
R$)>0 THEN 565 OO
•562 GOSUB 55:PRINT "[c I][s N][s O][SS][
s D][s E][s A][s L][s S][SS][s W][s I][s
 T][s H][SS][s G][s Y][s P][s S][s I][s
E][s S][c K][c I]";:GOTO 507 OL
•563 IF DL(WP)<4 THEN 562 FO
•564 GOSUB 55:PRINT "[SS][s G][s O][s T][
SS][s I][s T][c K][SS]";:CV=CV+FT:FT=0:G
OTO 507 CF
•565 GOSUB 55:PRINT "[RVSON][SS][s A][s L
][s L][SS][s R][s I][s G][s H][s T][c D]
[SS][s G][s Y][s P][s S][s I][s E][s S][
c S][SS][SS][s Y][s O][s U][SS][s W][s A
][s N][s T][SS][s T][s O][SS][s B][s U][
s Y][SS]" DG
•566 PRINT "[RVSON]"AM$(PD(WP),HB(WP),ASC
(LEFT$(TR$,1)),1)"[SS][c B][RVSOFF]"; IH
•567 GOTO 452 CP
•570 IF HB(WP)=1 THEN 573 FC
•571 DL(WP)=DL(WP)+1:IF EF(WP)>6 THEN EF(
WP)=EF(WP)-1 LL
•572 GOSUB 55:PRINT "[c I][s W][s E][c M]
[s L][s L][SS][s D][s O][SS][s W][s H][s
 A][s T][SS][s W][s E][SS][s C][s A][s N
][c Z][c Z][s K][s E][s E][s P][SS][s L]
[s O][s O][s K][s I][s N][s G][c I]";:GO
TO 507 BA
•573 IF DL(WP)>7 THEN 575 HB
•574 GOSUB 55:PRINT "[c I][s J][s U][s S]
[s T][SS][s W][s H][s A][s T][SS][s W][s
 E][SS][s N][s E][s E][s D][c Z][c Z][s
G][s Y][s P][s S][s Y][SS][s B][s E][s G
][s G][s A][s R][s S][c K][c I]";:GOTO 5
07 AH
•575 IF EF(WP)>4 THEN EF(WP)=EF(WP)-1:GOT
O 572 AL
•576 GOSUB 55:PRINT "[c I][s T][s H][s E]
[s R][s E][c M][s S][SS][s N][s O][s T][
s H][s I][s N][s G][SS][s W][s E][SS][s
C][s A][s N][SS][s D][s O][c Z][c Z][s S
][s O][s R][s R][s Y][SS][c I]";:GOTO 50
7 OE
•579 GOTO 507 CO
•580 IF FT<>0 THEN GOSUB 55:PRINT "[SS][s
G][s O][s T][SS][s I][s T][c K][SS]":CV
=CV+FT:FT=0:GOTO 583 FB
•581 I=DL(WP):GOSUB 50:IF I<3 THEN 440 CM
•582 GOSUB 55:PRINT "[SS][s W][s H][s A][
s T][c M][s S][SS][s T][s O][SS][s T][s
A][s K][s E][c B][SS]":DL(WP)=DL(WP)-2:G
OTO 585 GF
•583 IF DL(WP)<8 THEN 440 DN
•584 DL(WP)=DL(WP)-3:I=DL(WP):GOSUB 50:IF
 I<3 THEN 440 MO
•585 PRINT "[c I][s W][s E][SS][s D][s O]
[s N][c M][s T][SS][s L][s I][s K][s E][
SS][s Y][s O][s U][c D][SS][s T][s H][s
I][s E][s V][s I][s N][s G][SS][s G][s Y
][s P][s S][s I][s E][s S][c K][c I]":GO
TO 507 DJ
•586 IF DL(WP)<8 THEN 440 DN
•587 DL(WP)=DL(WP)-3:I=DL(WP):GOSUB 50:IF
 I<3 THEN 440 MO
•589 GOTO 507 CO
•600 VB=32768:POKE 56578,PEEK(56578)OR3:P
OKE 56576,(PEEK(56576)AND 252)OR 1 CN
•602 SB=0:POKE 53272,(SB*16)+4:SB=VB+1024
*SB MO
•604 BB=SB/256:POKE 648,BB AK
•611 REM ** SPRITE COLOR TABLE LA
•612 CT(0)=53287:FOR I=1 TO 7:CT(I)=CT(I-
1)+1:NEXT AN
•613 HH(0)=53248:VV(0)=53249:FOR I=1 TO 7
:HH(I)=HH(0)+I*2:VV(I)=VV(0)+I*2:NEXT OM
•618 HR=53264 FB
•620 ES=53269 FE
•622 POKE 53271,0 PC
•624 POKE 53277,0 PI
•626 POKE 53275,0 AG
•628 POKE 53276,30 DB
•630 POKE 53285,15:POKE 53286,7 FK
•635 FOR I=0 TO 7:BC(I)=255-BS(I):NEXT LB
•638 REM     *** INITIALIZE VALUES *** DK
•640 PRINT "[c 7]"; KM
•642 POKE 53281,0 AF
•644 POKE 53280,0 AE
•646 POKE CT(0),7:POKE CT(1),5:POKE CT(2)
,2:POKE CT(3),6:POKE CT(4),12 EE
•659 REM       *** ML TABLE SETUP *** CA
•661 POKE 37920,4:POKE 37921,4 CB
•663 POKE 37922,1 PO
•665 POKE 37923,0 PA
•667 POKE 37924,1:POKE 37925,1 FL
•669 POKE 37936,1 AJ
•671 POKE 37940,1 PO
•673 POKE 37941,0 PA
•674 REM ** GO-SPEED TIMER (NUMBER OF SPR
ITE 0 MOVES PER INTERRUPT [1=SLOWEST]) MH
•675 POKE 37926,3:POKE 37928,3 GI
•677 POKE 37927,0:POKE 37935,0:POKE 37943
,0 MA
•679 POKE 53282,1:POKE 53283,7:POKE 53284
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,9                                                   GD
•690 REM                                             JD
•693 REM *** SAFETY PROCEDURES ***                   CM
•694 POKE 657,128:REM DISABLE SHIFT/COMMO
 DORE CHARACTER SET SWITCH                           OA
•695 POKE 808,234:POKE 792,193:REM DISABL
 E STOP AND STOP/RESTORE                             JJ
•696 RETURN                                          IM
•699 REM *** INTRO SCREEN ***                        PN
•700 POKE 53281,0:POKE 53280,4:POKE 53265
 ,PEEK(53265)OR 64:PRINT "[c 7][CLEAR]";             CL
•701 POKE 53282,7:POKE 53283,9:POKE 53284
 ,1                                                  ML
•705 PRINT "[HOME][DOWN][DOWN]"TAB(14)"[R
 VSON][s G][s Y][s P][s S][s Y][SS][SS][s
  P][s I][s L][s O][s T][RVSOFF]":PRINT:P
 RINT                                                FH
•710 PRINT "[4" "]YOU HAVE BEEN CHOSEN TO
  PILOT THE"                                         PL
•711 PRINT "FAMILY'S STARSHIP IN SEARCH O
 F WORLDS                                            HE
•712 PRINT "WHERE WE CAN TRADE, PUT ON SH
 OWS, AND"                                           LC
•713 PRINT "PERHAPS FIND SOME SPECTACULAR
  TREASURE.":PRINT                                   MF
•714 PRINT "[4" "]MOST IMPORTANT, THOUGH,
  IS TO KEEP                                         ID
•715 PRINT "THE FAMILY SAFE.  THERE ARE D
 ANGERS OUT"                                         ME
•716 PRINT "AMONG THE STARS.  AND YOU MUS
 T ANSWER"                                           OO
•717 PRINT "FOR ANY LIVES THAT ARE LOST."
 :PRINT:PRINT                                        MC
•720 PRINT "[RVSON][4" "]HOW DANGEROUS A
 VOYAGE DO YOU DARE  ATTEMPT?"                       EP
•721 PRINT "[5"[SS]"][s V][s E][s R][s Y]
 [SS][s D][s A][s N][s G][s E][s R][s O][
 s U][s S][4"[SS]"]"                                 JJ
•722 PRINT "[5"[SS]"][s B][s O][s L][s D]
 [SS][s B][s U][s T][SS][s N][s O][s T][S
 S][s C][s R][s A][s Z][s Y]"                        LN
•723 PRINT "[5"[SS]"][s P][s R][s E][s T]
 [s T][s Y][SS][s S][s A][s F][s E][7"[SS
 ]"]":PRINT:PRINT "(USE JOYSTICK IN PORT
 2)";                                                CL
•724 VV$(0)="[HOME]":FOR I=1 TO 24:VV$(I)
 =VV$(I-1)+"[DOWN]":NEXT:RR$="[RVSON]=[RV
 SOFF]":RX$="[SS]":LV=18                             PI
•725 RR$="[RVSON]=[RVSOFF]":RX$="[SS]":LV
 =18:XV=LV                                           HF
•726 PRINT VV$(XV)RX$VV$(LV)RR$;:XV=LV               EF
•727 JB=0:JY=0:GOSUB 40:IF JB>0 THEN LV=L
 V-17:GOTO 731                                       FG
•728 IF JY=1 THEN LV=LV-1:IF LV<18 THEN L
 V=20                                                FA
•729 IF JY=2 THEN LV=LV+1:IF LV>20 THEN L
 V=18                                                IE
•730 GOTO 726                                        CP
•731 PRINT "[CLEAR][RVSON][s L][s A][s S]
 [s T][SS][s M][s I][s N][s U][s T][s E][
 SS][s I][s N][s S][s T][s R][s U][s C][s
  T][s I][s O][s N][s S]"                            JO
•735 PRINT:PRINT "[3" "]THE SHIP'S COMPUT
 ER WILL LOCATE[7" "]PLANETS:":PRINT                 IL
•736 PRINT "[3" "][RVSON][s G][s A][s S][
 SS][s G][s I][s A][s N][s T][s S][3"[SS]
 "] FOR HYDROGEN FUEL[5" "]":PRINT                   EE
•737 PRINT "[3" "][RVSON][s R][s O][s C][
 s K][s Y][SS][s P][s L][s A][s N][s E][s
  T][s S] FOR THE ELEMENTS THAT "                    BO
•738 PRINT " [RVSON]SUPPORT LIFE--CARBON,
  OXYGEN, NITROGEN"                                  JF
•740 PRINT:PRINT "[3" "]YOUR JOB IS TO PI
 LOT THE SHIP INTO"                                  HG
•741 PRINT " STATIONARY ORBIT, SO IT FOLL
 OWS RIGHT"                                          JO
•742 PRINT " ALONG WITH THE PLANET.  FUEL
  AND"                                               FE
•743 PRINT " SUPPLIES ARE TAKEN ABOARD BY
  MACHINES.":PRINT                                   OL
•744 PRINT "[3" "]TO VISIT A PLANET, PRES
 S THE BUTTON"                                       LD
•745 PRINT " WHILE IN STATIONARY ORBIT."             KB
•750 PRINT VV$(24)"[s P][s R][s E][s S][s
  S][SS][s B][s U][s T][s T][s O][s N][SS
 ][s T][s O][SS][s G][s O][SS][s O][s N]"
 ;                                                   EB
•751 GOSUB 40                                        PA
•760 PRINT "[CLEAR][RVSON] YOU CAN TAKE A
  NAP NOW--IT TAKES A[5" "]";                        MF
•761 PRINT "[RVSON] WHILE TO LOAD SUPPLIE
 S ABOARD THE SHIP."                                 BH
•765 RETURN                                          IM
•800 RP(WP)=0:J=0                                    MF
•805 IF(WP=2)OR(WP=4) THEN J=RND(0)*100              PP
•807 IF J>88 THEN RP(WP)=1:IF J>96 THEN R
 P(WP)=2:PN(WP)=254:PD(WP)=10                        EI
•810 HB(WP)=INT(RND(0)*3):IF RP(WP)=2 AND
  HB(WP)=0 THEN HB(WP)=1                             KO
•811 DL(WP)=3+INT(6*RND(0))+LV-HB(WP):EF(
 WP)=6+INT(6*RND(0))-LV-HB(WP)                       FN
•812 HT(WP)=1+INT(3*RND(0))                          JO
•820 IF RP(WP)=2 THEN RETURN                         FJ
•822 PV=PV+1:IF PV>28 THEN SP%=1:GOTO 885            CN
•825 I=LEN(PX$(HB(WP))):IF I<1 THEN 810              BK
•830 J=INT(RND(0)*I)+1:GOSUB 860                     ED
•835 PD(WP)=ASC(MID$(PX$(HB(WP)),J,1))               PF
•840 IF I>2 THEN GOTO 855                            JH
•845 IF I=1 THEN PX$(HB(WP))="":RETURN               LH
•850 PX$(HB(WP))=MID$(PX$(HB(WP)),XQ(J),1
 ):RETURN                                            KD
•855 IF J=1 THEN PX$(HB(WP))=RIGHT$(PX$(H
 B(WP)),I-1):RETURN                                  CM
•856 IF J=I THEN PX$(HB(WP))=LEFT$(PX$(HB
 (WP)),I-1):RETURN                                   CP
•857 PX$(HB(WP))=LEFT$(PX$(HB(WP)),J-1)+R
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IGHT$(PX$(HB(WP)),I-(J+1)):RETURN            HH
·860 K=LEN(PY$):L=1+INT(RND(0)*K)            IE
·865 PN(WP)=ASC(MID$(PY$,L,1))               DP
·868 IF L=1 THEN PY$=RIGHT$(PY$,K-1):RETU
RN                                           OA
·869 IF L=K THEN PY$=LEFT$(PY$,K-1):RETUR
N                                            PF
·870 PY$=LEFT$(PY$,L-1)+RIGHT$(PY$,K-(L+1
)):RETURN                                    EP
·875 IF I=0 THEN GL$=RIGHT$(GL$,LEN(GL$)-
1):RETURN                                    KO
·876 IF I=LEN(GL$)-1 THEN GL$=LEFT$(GL$,I
-1):RETURN                                   GN
·880 GL$=LEFT$(GL$,I)+RIGHT$(GL$,LEN(GL$)
-(I+1)):RETURN                               LG
·885 PRINT VV$(23)"[SS][SS][s Y][s O][s U
][SS][s L][s E][s D][SS][s U][s S][SS][s
 T][s O][SS][c R][c O][SS][s W][s O][s R
][s L][s D][s S][c Z][c Z][s G][s O][s O
][s D][SS][s W][s O][s R][s K][c K][3"[S
S]"]"BB$;                                    FE
·890 RETURN                                  IM
·900 FOR I=1 TO 4:POKE HH(I),20+INT(RND(9
)*220)                                       IO
·901 POKE VV(I),50+INT(RND(9)*190):NEXT      OC
·902 POKE HR,0                               IJ
·909 REM ** PUT STARS ON THE SCREEN          MF
·910 PRINT "[CLEAR]";:FOR I=0 TO 49:POKE
VB+INT(RND(9)*1024),46:NEXT                  EO
·915 FOR I=0 TO 8:POKE VB+INT(RND(9)*1024
),42:NEXT                                    IK
·919 REM ** STARSHIP POSITION                LP
·920 POKE 53248,175:POKE 53249,150           AE
·921 REM ** STARSHIP DIRECTION               CN
·922 POKE VB+1016,16                         ED
·929 REM ** SETUP STRINGS                    NL
·931 BB$="[RVSOFF][32" "]"                   BD
·935 FF$="[RVSON]FUEL[28" "]"                FA
·936 SS$="[RVSON][s S][s U][s P][s P][s L
][s I][s E][s S][24"[SS]"]"                  EF
·937 QF=33:QS=33                             KO
·938 FOR I=0 TO 2:PX$(I)=LEFT$(PZ$,10):NE
XT                                           OK
·939 REM ** LEVEL OF PLAY                    CO
·940 TS=50:IF LV<3 THEN TS=20:IF LV<2 THE
N TS=10                                      LI
·941 TM=TS:FM=TS/2                           PH
·942 XQ(1)=2:XQ(2)=1                         HN
·944 PRINT VV$(23)" PAUSE A MOMENT FOR GA
RBAGE DISPOSAL [3"."]";                      IA
·945 FOR WP=1 TO 4:GOSUB 800:NEXT            PE
·946 CV=1                                    IF
·947 RETURN                                  IM
·1998 REM    ***  MACHINE LANGUAGE  ***      OA
·1999 REM LOAD ML FILE                       HN
·2000 LOAD "GYPSY VIDEO",8,1                 JI
·2100 OPEN 2,8,2,"GYPSY PLANETS"             KH
·2110 DIM NM$(254),GN$(33),MM$(1,2),PM$(1
0,2),AM$(10,2,2,1)                           CH
·2120 TN=0:NM$(254)="[s A][s R][s T][s I]
[s F][s I][s C][s I][s A][s L][SS][s S][
s A][s T][s E][s L][s L][s I][s T][s E]"     AL
·2130 INPUT#2,NM$(TN):IF NM$(TN)="[5"X"]"
 THEN 2145                                   CN
·2140 TN=TN+1:GOTO 2130                      GE
·2145 PZ$="":FOR I=0 TO 254:PZ$=PZ$+CHR$(
I):NEXT:PY$=LEFT$(PZ$,TN):L=FRE(9)           DP
·2150 FOR I=0 TO 1:FOR J=0 TO 2:INPUT#2,M
M$(I,J):NEXT:NEXT                            OM
·2160 FOR I=0 TO 32:INPUT#2,GN$(I):NEXT:G
L$=LEFT$(PZ$,33)                             NM
·2161 PRINT "[CLEAR][RVSON][DOWN][8"[SS]"
][s H][s E][s R][s E][SS][s I][s S][SS][
s T][s H][s E][SS][s G][s Y][s P][s S][s
 Y][SS][s F][s A][s M][s I][s L][s Y][8"
[SS]"]"                                      OI
·2163 GB=INT(RND(0)*33):GB$=GN$(GB):I=GB:
GOSUB 875                                    DD
·2164 PRINT "[BLUE]";:FOR I=1 TO 32 STEP
2                                            DG
·2165 PRINT ,GN$(ASC(MID$(GL$,I,1))),GN$(
ASC(MID$(GL$,I+1,1))):NEXT:PRINT "[c 7]"
;                                            LA
·2166 A$="[SS][BLUE]"+GB$+"[c 7][SS][s I]
[s S][SS][s H][s E][s A][s D][SS][s O][s
 F][SS][s T][s H][s E][SS][s F][s A][s M
][s I][s L][s Y][c S]":L=INT((42-LEN(A$)
)/2)                                         HD
·2167 B$="[RVSON]":FOR I=1 TO L:B$=B$+"[S
S]":NEXT:A$=B$+A$:FOR I=LEN(A$) TO 42        GF
·2168 A$=A$+"[SS]":NEXT:PRINT:PRINT A$       PH
·2169 PRINT " NOW THE COMPUTER WILL UPDAT
E ITS STAR"                                  KP
·2170 PRINT " CHARTS--AND THEN WE'RE ON O
UR WAY!"                                     JC
·2180 FOR I=0 TO 2:FOR J=0 TO 9:INPUT#2,P
M$(J,I)                                      CH
·2190 FOR K=0 TO 1:FOR L=0 TO 2:INPUT#2,A
M$(J,I,L,K):NEXT:NEXT:NEXT:NEXT              FP
·2195 FOR I=1 TO 2:READ PM$(10,I):FOR K=0
 TO 1:FOR L=0 TO 2                           OD
·2196 READ AM$(10,I,L,K):NEXT:NEXT:NEXT      JO
·2200 CLOSE 2:RETURN                         JP
·2210 DATA A SPANKING NEW SPACE STATION W
ITH A CREWOF LONELY HUMANS                   KC
·2211 DATA GOT WAYLAID BY SEX-STARVED CRE
W MEMBERS AND NOW REFUSES TO LEAVE           AI
·2212 DATA STUMBLED ON ILLEGAL DRUGS AND
WAS SHOT,WAS CAUGHT SELLING HOOCH            CI
·2213 DATA AN URGENT MESSAGE OF AN ALIEN
INVASION,VITAL DATA ABOUT THIS SYSTEM        AK
·2214 DATA A THRILLING NOVEL THE CREW HAS
 WRITTEN  IN THEIR ENDLESS SPARE TIME        NM
·2220 DATA AN ANCIENT ALIEN ORBITAL VESSE
L WITH A  CREW OF GIANT SPEECHLESS BEES      BC
·2221 DATA WENT EXPLORING--FOUND THE QUEE
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 119 and 120 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
N AND WAS STUNG TO DEATH                     CD
•2222 DATA TRIED TO BREATHE THE ALIEN AIR
,WAS KIDNAPPED AND USED FOR LARVA FOOD       MH
•2223 DATA A KIND OF HONEY THAT GIVES TEM
PORARY    TELEPATHIC ABILITIES               HL
•2224 DATA A STRUCTURAL BEESWAX STRONGER
THAN STEEL                                   DD
•2225 DATA OBSERVATIONS OF THE BEES--INCL
UDING     THEIR MAGNIFICENT DANCING          KM
```

SANTA'S BUSY DAY
FROM PAGE 118

```
•10 REM SANTA'S BUSY DAY                     LI
•20 REM GEORGE TREPAL                        BM
•30 REM 2650 ALTURAS ROAD                    IP
•40 REM BARTOW, FL  33830                    AG
•50 PRINT"[CLEAR][6"[DOWN]"]  DO YOU WANT
 AN <E>ASY OR A <R>EGULAR"                   OD
•55 PRINT"  GAME?"                           IC
•60 GETA$: IFA$<>"" THEN 60                  OJ
•70 GETA$:IF A$="" THEN 70                   FM
•80 IF A$="E" THEN POKE 828,1                JC
•90 C=896: CT=44: POKE53280,0                EN
•100 READ D$: L=LEN(D$): PRINT "[CLEAR][1
 1"[DOWN]"][WHITE]"SPC(8)"COUNTING DOWN T
 O ZERO  ";                                  LG
•105 CT=CT-1: PRINT CT: POKE 53281,CT        NB
•110 FOR J=1TOL STEP2: M$=MID$(D$,J,2)       AJ
•120 H$=LEFT$(M$,1): L$=RIGHT$(M$,1)         FL
•130 H=ASC(H$)-48: IFH>10 THEN H=H-7         HK
•140 L=ASC(L$)-48: IFL>10 THEN L=L-7         FO
•150 P=H*16+L:IF P>255 THEN 200              EL
•155 POKE C,P: C=C+1                         LN
•160 NEXT:GOTO100                            NM
•200 IF C<1000 THEN C=49152: GOTO 100        GC
•210 SYS49160                                KA
•896 DATA 0015000AA8002AAA0095558 06AAA40
 A596806FBE405EB940555540 16A500159          OE
•928 DATA 5002556 00A95A82AA6AA2AAAAA29AA9
 A19AA9915AA95156A5505555401555 0ZZ          BF
•49152 DATA 0100D8FFFFFF2800A9008D49038D4
 C0385FBA90C85FCA000A92091FBC8D0FBE6         AF
•49184 DATA FCA5FCC99FD0F1A9568D4303A9518
 5FBA92885FDA91285FC85FEA9932 0D2FFA2        IC
•49216 DATA 00A000AD430391FDC8C027D0F918A
 5FD692885FD9002E6FEE8E051D0E4A000A9         GH
•49248 DATA 0491FBA9FF8D0FD4A9808D12D4AD1
 BD4290385ADAA0AA818B900C065FB85AAB9         FM
•49280 DATA 01C065FC85AB18B900C065AA85FDB
 901C065AB85FEA000B1FDCD4303D0128A91         JG
•49312 DATA FDA92091AAA5FD85FBA5FE85FC4C6
 3C0E88A2903C5ADD0BCB1FBAAA92091FBE0         DE
•49344 DATA 04F01A8A0AA8A20238A5FBF900C08
 5FBA5FCF901C085FCCAD0EE4C63C0A90F8D         PI
•49376 DATA 48038502A9068D20D08D21D020F2C
 04C10C1A502A00099 00D89900D99900DA99        JI
•49408 DATA 00DBC8D0F1A228A90D9DC0DBCAD0F
 A60AD43038D4F128DCF1EA9208D76128D50         EH
•49440 DATA 128D801E8DA61EA90085FB8D3F03A
 9FF85FDA91285FCA92385FEA000A20018A5         LE
•49472 DATA FD690185FDA5FE690085FEB1FB91F
 D18A5FD697885FDA5FE690085FEB1FB91FD         OO
•49504 DATA 18A5FD697885FDA5FE690085FEB1F
 B91FD38A5FDE9F085FDA5FEE90085FEE8E0         EF
•49536 DATA 03D0BBEE3F03AD3F03C928D01218A
 5FD69F085FDA5FE690085FEA9008D3F0318         KM
•49568 DATA A5FB690185FBA5FC690085FCA5FCC
 920D08AA5FBC900D084A9A08D4203A9FF8D         FM
•49600 DATA 0FD4A9808D1BD4A2D2A000AD1BD4C
 92730F9C99010F585FCAD1BD485FBB1FBCD         NP
•49632 DATA 4303F0E7AD420391FBCAD0DFAD420
 3C953F00AA9538D4203A2024CCBC1A204A9         IL
•49664 DATA 309DC107CAD0FA200DC24C1DC2A22
 0A95B9DC707CAD0FAA9018D4F0360A9988D         JF
•49696 DATA 4403A9218D4503A9008D4603A90F8
 D18D4A9018D1CD08D15D0A9B08D00D0A98C         MB
•49728 DATA 8D01D0A9028D27D0A90E8DF807A90
 18D25D0A90A8D26D0AD00DC290F8D4003CE         FM
•49760 DATA 4603AD4603C900D012A9008D04D4A
 D4803850220F2C0A9068D20D038A90FED40         CN
•49792 DATA 038D4003C900F0038D4D03AD3C03C
 901D006AD40038D4D03AD4D03C901D0034C         FC
•49824 DATA BAC2C902D0034CE1C2C904D0034C0
 8C3C908F0034C53C34C2FC3ADCC058D4103         PF
•49856 DATA CD4303D008A9028D4D034C53C338A
 D4403E9788D4403AD4503E9008D45034C53         DJ
•49888 DATA C3AD1C068D4103CD4303D008A9018
 D4D034C53C318AD440369788D4403AD4503         GN
•49920 DATA 69008D45034C53C3ADF3058D4103C
 D4303D008A9088D4D034C53C338AD4403E9         HE
•49952 DATA 018D4403AD4503E9008D45034C53C
 3ADF5058D4103CD4303D008A9048D4D034C         BL
•49984 DATA 53C318AD440369018D4403AD45036
 9008D4503A90085FDA90485FEA9008D4E03         DA
•50016 DATA 8D4703AD440385FBAD450385FCA00
 0B1FB91FD18A5FB690185FBA5FC690085FC         OL
•50048 DATA 18A5FD690185FDA5FE690085FEEE4
 703AD4703C928D012A9008D470318A5FB69         NF
•50080 DATA 5085FBA5FC690085FCE8D0C3EE4E0
 3AD4E03C904D0034CC2C3C903D0B2A2684C         AJ
•50112 DATA 6FC3AD4103CD4303D026A90885028
 D20D020F2C0A9088D05D4A9818D04D4A919         GL
•50144 DATA 8D01D4A90A8D4903A9028D4603EE4
 F03AD4103C9A0D01EA90785028D20D020F2         KN
•50176 DATA C0A9018D4B03A90F8D05D4A9118D0
 4D4A9058D4603AD4103C953D026A9008502         IL
•50208 DATA 20F2C0A90F8D05D4A9218D04D4A90
 48D4603A280A000EE21D0C8D0FAE8D0F720         DC
•50240 DATA 0DC2AD4903C900F017A90F8D2C05A
 9158D5405A9038D7C05A9088DA405CE4903         NB
```

```
•50272 DATA 18AD440369B485FBAD4503690585F
CA92091FB8D4103AD4B03C901D049A9008D    MF
•50304 DATA 4B03A9008D4A0318ADC4076901C93
AF0068DC4074CA1C4A9308DC407A9018D4A    FN
•50336 DATA 03A20218BDC1076D4A03C93AF00B9
DC107A9008D4A034CC3C4A9309DC107A901    JP
•50368 DATA 8D4A03CAD0DDEE4C03AD4C03C900D
003EE4F03AD4F03AAA9A09DC707CAD0F8AD    NA
•50400 DATA C207C932D0034CF3C4AD4F03C920D
0484CF3C4A9008D04D48D15D0A90F8DF305    ML
•50432 DATA A9168DF405A9058DF505A9128DF60
5A9028502A9008D21D020F2C0A9018DF3D9    BA
•50464 DATA 8DF4D98DF5D98DF6D9A5C5C940D0F
AA5C5C940F0FA4C08C04C57C250ZZ          KH
```

COMMODORE ROOTS

Continued from page 92

noteworthy features. One of these features is a technique called address modification. We will take a close look at this feature in next month's column. □

SEE PROGRAM LISTING ON PAGE 122

SKETCHER Program

(Lines to be added to BLACKBOARD.S, page 122; see text of article!)

```
*
* PRINT DOT AT MIDSCREEN
*
         LDA   #VMID
         STA   VPSN
         LDA   #<HMID
         STA   HPSN
         LDA   #>HMID
         STA   HPSN+1
         JSR   PRINT
*
* READ JOYSTICK
*
* FIRST CHECK TRIGGER BUTTON
*
READJS   LDA   CIAPRA
         AND   #$10
         BEQ   START
*
* NOW READ JOYSTICK
*
         LDA   #$0F
         PHA
         AND   CIAPRA
         STA   JSV
         PLA
         SEC
         SBC   JSV
         STA   JSV
*
         TAX
         BEQ   READJS
         LDA   RELADS-1,X
         STA   MODREL+1
MODREL   BNE   *
MODR1
*
NIL1     JMP   READJS
*
* ROUTINES TO MOVE JOYSTICK
*
UP       JSR   MOVEUP
         JMP   DOIT
*
DOWN     JSR   MOVEDN
         JMP   DOIT
*
LEFT     LDX   HPSN
         LDY   HPSN+1
         TXA
         BNE   DECLSB
         DEY
DECLSB   DEX
         STX   HPSN
         STY   HPSN+1
         JMP   DOIT
*
UPANDL   JSR   MOVEUP
         JMP   LEFT
*
DNANDL   JSR   MOVEDN
         JMP   LEFT
*
NIL2     JMP   READJS
*
RIGHT    LDX   HPSN
         LDY   HPSN+1
         INX
         BNE   NOINC
         INY
NOINC    STX   HPSN
         STY   HPSN+1
         JMP   DOIT
*
UPANDR   JSR   MOVEUP
         JMP   RIGHT
*
DNANDR   JSR   MOVEDN
         JMP   RIGHT
*
* SUBROUTINES TO MOVE UP & DOWN
*
MOVEUP   LDX   VPSN
         DEX
         STX   VPSN
         RTS
*
MOVEDN   LDX   VPSN
         INX
         STX   VPSN
         RTS
*
* "DOIT" SUBROUTINE
*
DOIT     JSR   PRINT
         JMP   READJS
*
* MORE SUBROUTINES START HERE
*
* MAKE SURE DOT IS WITHIN RANGE
*
CHECK    LDA   VPSN
         BEQ   RAISE
         CMP   #VMAX-1
         BCS   LOWER
         JMP   HCHECK
RAISE    INC   VPSN
         JMP   HCHECK
LOWER    LDA   #VMAX-1
         STA   VPSN
*
HCHECK   BIT   HPSN+1
         BPL   OKLOW
         LDA   #1
         STA   HPSN
         LDA   #0
         STA   HPSN+1
         RTS
*
OKLOW    LDA   #<HMAX-2
         CMP   HPSN
         LDA   #>HMAX-2
         SBC   HPSN+1
         BCC   TOOHI
         RTS
*
TOOHI    LDA   #<HMAX-2
         STA   HPSN
         LDA   #>HMAX-2
         STA   HPSN+1
         RTS
*
* PRINT DOT ON SCREEN
*
PRINT    JSR   CHECK
         JSR   PLOT
*
         LDA   HPSN
         PHA
         LDA   HPSN+1
         PHA
*
         LDA   HPSN
         BNE   SKIP
         DEC   HPSN+1
SKIP     DEC   HPSN
         JSR   CHECK
         JSR   PLOT
*
         PLA
         STA   HPSN+1
         PLA
         STA   HPSN
         RTS
*
RELADS   DFB   UP-MODR1
         DFB   DOWN-MODR1
         DFB   NIL1-MODR1
         DFB   LEFT-MODR1
         DFB   UPANDL-MODR1
         DFB   DNANDL-MODR1
         DFB   NIL2-MODR1
         DFB   RIGHT-MODR1
         DFB   UPANDR-MODR1
         DFB   DNANDR-MODR1
*
```

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Mitey Mo is being hailed as "the best price/performance communications package available." Its software has received the endorsement of the U.S. Commodore Users Group, which gives a money-back guarantee to members. It is truly the industry standard, and no wonder. It's the most user-friendly modem you can buy—it will take you online faster and easier than anything else.

Mitey Mo opens up a world of practical and exciting uses for your C-64. It lets you send and receive electronic mail, link up with community bulletin boards, play computer games with people in distant places, tap into library resources, and much more. All at your convenience.

Until Mitey Mo, Commodore's 1650 Automodem was the obvious choice when you went looking for a modem for your computer. Like Mitey Mo, it has "auto answer"—it receives data while unattended. And both modems are "auto dialers"—you dial right on the computer's keyboard. But that's about where the similarity ends.



Mitey Mo can dial up to 9 numbers sequentially. But suppose you dial a number and find it's busy. Mitey Mo has "auto redial"—it hangs up and redials immediately until it gets through. With the other modem you have to redial each time—and somebody with auto redialing can slip in ahead of you.

Mitey Mo is menu driven. It lists the things you can do on the screen. Select a number and you're on your way. Since Automodem isn't menu driven, you'll be hunting through the manual a lot.

With Mitey Mo, your computer's function keys are programmable—you can save yourself plenty of keystrokes. Not so with the other modem. And only Mitey Mo lets you store data to review or print it later.

MODEM FEATURES	MITEY MO	COMMODORE AUTOMODEM
Auto Dial/Answer	YES	YES
Auto Redial	YES	NO
Smart 64 Software	YES	NO
Function Keys Programmable	YES	NO
Upload/Download Text & X-Modem	YES	NO
VT-52/VT-100 Emulation	YES	NO
Menu Driven	YES	NO
28K Software Buffer	YES	NO
Easy-to-Use Manual	YES	NO
Bell 103 Compatible	YES	YES
Multiple Baud Rates	YES	YES
Cable Included	YES	YES
Single Switch Operation	YES	NO
Warranty	3 years	90 days

Some mighty interesting features—ours and theirs. Yours to decide.

Mitey Mo has just one switch, the Smart 64 software does the rest. With the other modem you'll have to remember to check three switches, otherwise you may be answering when you mean to be originating.

Mitey Mo is half the size of the other modem. The very latest technology allows miniaturization and increased reliability, as well. Mitey Mo is so reliable, we gave it a full three-year warranty. The other modem gives 90 days, then you're on your own.

Not only will you find Mitey Mo mighty useful, you'll find it mighty reasonably priced. When you buy it, you'll get $15 of CompuServe access time and 2 hours of PlayNet free, as well. See your dealer or call us directly to order your Mitey Mo.

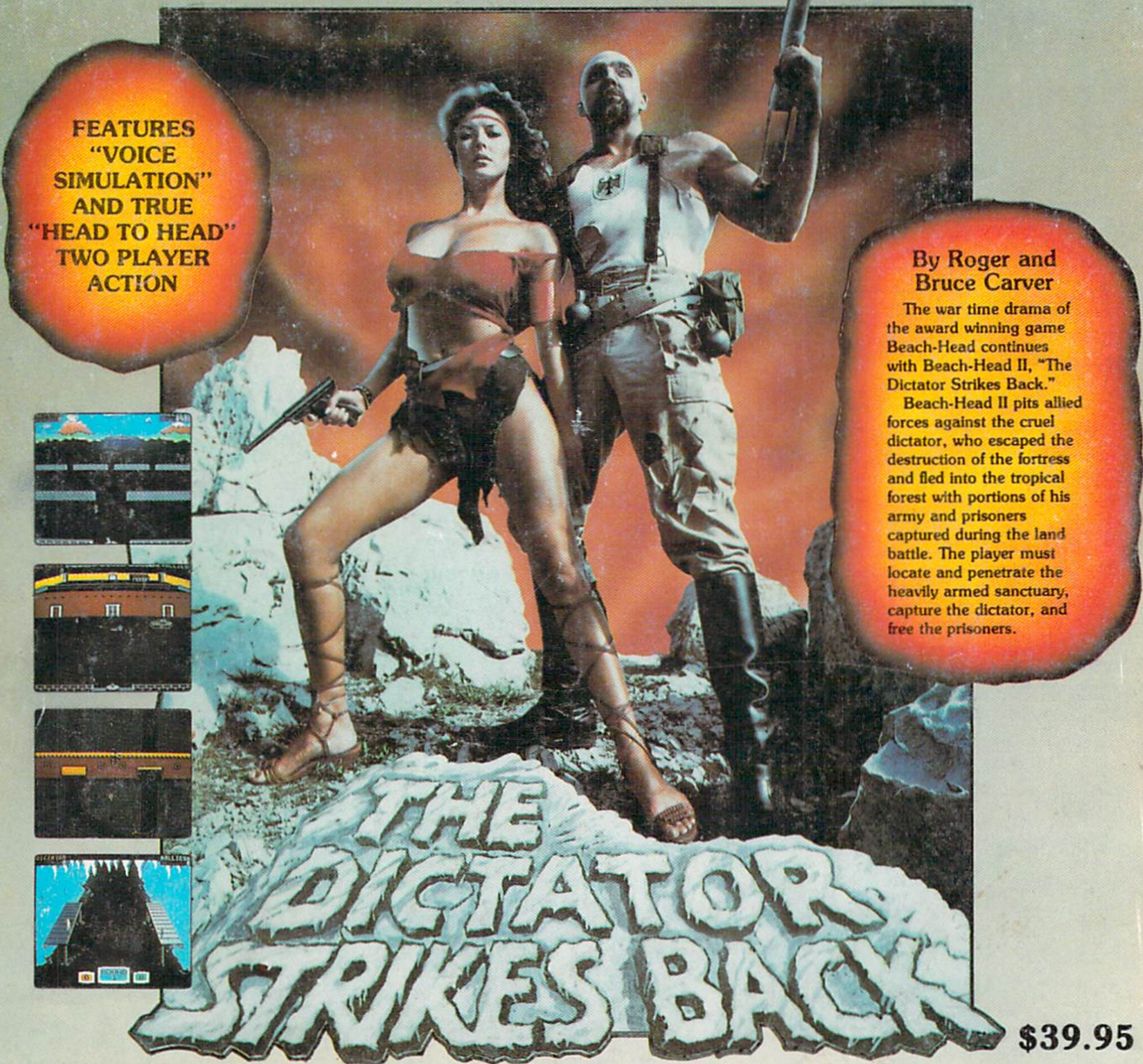


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